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THESIS

THE EFFECT OF ROLL AND PITCH ON
ANTENNA RADIATION PATTERNS

by

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The Effect of Roll and Pitch on Antenna Radiation Patterns

by

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ABSTRACT

The strength of an incoming signal to a shipboard communications station is measured. The variations in this signal are analyzed for various conditions of roll, pitch, and signal direction. Graphs and computer outputs are used to present the magnitude and randomness of these signal variations. A smooth surface approximation is used to simulate the problem, and this simulation is compared to observed data.

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I. INTRODUCTION

The radiation pattern of a shipboard antenna is complicated by the fact that the sea is not a smooth ground plane. In reality the sea is a rough surface which will scatter an incoming wavefront. In addition to this problem, the antenna is not a fixed object in space; it moves in both position and orientation as the ship rolls and pitches. The ship itself is another complicating factor. Even though the ship is electrically insulated from the antenna, interaction occurs, just as there is interaction among reflectors, directors, and the active elements of a yagi antenna. As a result, the shipboard antenna pattern is too complex to be predicted accurately even with the advanced matrix methods of computer solution which have been recently developed. The mathematical formulation of this problem is feasible, but the number of required calculations is prohibitive.

The number of complicating factors makes approximations necessary. Ultimately then, all attempts to solve the problem of shipboard antenna systems are limited by the approximations made. Even if all approximations are valid, any deterministic solution is doomed to failure due to the randomness of the sea. Some type of probabilistic model is necessary to predict system behavior.

II. THEORY OF THE PROBLEM

A. SIMPLE ANTENNA OVERGROUND

The problem of the vertical stub antenna of length "L" and height "H" above a plane horizontal ground of infinite conductivity can be easily solved by the method of images.[1] The electric field intensity of this system may be defined as a function of elevation angle "α" and distance "r".

$$E(\alpha,r) = \frac{60}{r}\sqrt{\frac{W}{R_{11}+R_{1L}}}\;\frac{\cos(\ell(2\pi/\lambda)\sin\alpha) - \cos(\ell(2\pi/\lambda))}{\cos\alpha}$$

where R_{11} = self-resistance of a vertical stub antenna of length ℓ referred to the point of current maximum

R_{1L} = effective loss resistance of antenna referred to same point

W = power input

In a shipboard VHF communications system the antenna is often located several wavelengths above the sea. When a vertical stub is positioned several wavelengths above the perfect ground plane, the horizontal field pattern remains circular or isotropic, but as the antenna is elevated the vertical pattern will include more and more null and maximum points. That is, as the antenna is elevated the vertical pattern will contain more lobes. This increased number of lobes can significantly change received signal strength. A

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[1]Kraus, John D., Antennas, p. 314, McGraw-Hill, 1950.

small change in the elevation angle of the incoming signal can cause a large change in received signal strength. This same effect can be expected to occur in shipboard systems.

B. ROTATION OF THE ANTENNA

If the stub antenna over perfect ground is tilted in any direction the field strength pattern will change. This effect can be explained using the pattern multiplication method of analysis. According to this method an antenna array consisting of identical elements is considered to be an arrangement of point sources. The final pattern is the point source pattern multiplied by the element factor. In the case of the tilted stub over ground, the distance between the real and the image point sources will remain the same, but the rotation of the dipole pattern will change the overall field pattern. Thus as a ship rolls and pitches, and therefore the antenna is tilted, two effects take place. One effect is the change in the overall antenna pattern, and the other is the change in the point of entry of the electromagnetic waves on the antenna pattern. These two effects cause large but predictable variations in signal strength. Inherent in this discussion however, is the smooth surface approximation. The random wave patterns of the sea have not been included.

C. EFFECTS OF A ROUGH GROUND PLANE

Reflection of electromagnetic waves from a smooth surface as used in the previous discussion is a well understood

phenomena. In fact, the laws of reflection from a smooth surface are so well known that they are used to determine electrical properties of materials. If the surface is rough however, the electromagnetic energy will be scattered in various directions. To predict the form of the scattered field is a very difficult problem. This phenomenon has received particular attention in connection with radio propagation in the VHF range. In line-of-sight communication systems the field at the receiving point may be broken up into a direct and a reflected ray. In the case of a smooth earth the field pattern may be easily predicted as in the previous discussion of the tilted stub. When the surface is rough the problem rapidly expands. Since the surface of the sea is time varying, an exact solution is not possible. The received signal will be subject to fades which are determined by the form and movement of the sea. In analyzing random rough surfaces the surface is normally assumed to be isotropically rough. That is, the surface is assumed to have the same statistical distribution in all directions over the surface. When the surface distribution is different in the X and Y directions, the calculation becomes very involved. This case of anisotropic roughness occurs for the surface of the sea which may have a different distribution on and across the direction of the wind.[2]

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[2] Beckman, P., and Spizzichino, A., The Scattering of Electromagnetic Waves from Rough Surfaces, p. 405, MacMillan, 1963.

D. THE SEA AS A GROUND PLANE

The surface of the sea has been the subject of many theoretical and experimental investigations. Schooley [1954] and Cox and Munk [1954] have measured the distribution of the slopes of the surface of the sea by optical methods. According to Cox and Munk this distribution is to a first approximation a normal type distribution. The standard deviation of this distribution is a function of the wind-speed. Their investigation also indicates that the slopes of the waves were higher in the upwind direction. This means that the sea is not isotropic. The distribution of wave slopes derived from measurement of back-scatter of radar pulses and by optical methods are in agreement. In both cases the distribution is normal.[3] Information obtained to date indicates that to a second approximation the wave slopes are slightly asymmetrical and they depend upon the direction of the wind. Thus although the mechanism by which the sea scatters an electromagnetic wave is known, the sea surface is not known well enough to predict at any instant what the signal strength will be.

E. THE COMPOSITE PICTURE

Major signal strength variations will occur as indicated previously due to the roll and pitch of the antenna. In addition to these variations there is a randomness in the

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[3] *Ibid.*, p. 409.

variations due to scatter from the sea. As the ship rolls to one side the signal strength will not always move to the value predicted by the smooth surface approximation, it will be offset by some value determined by the sea reflections at that instant. Thus signal strength will vary to a band of values. The mean of this band should be determined by the degree of roll and pitch, and the variance of the band should depend upon wind conditions.

III. EXPERIMENTAL PROCEDURE

A. EQUIPMENT SET UP

1. Antenna Properties

In order to reduce the number of variable factors included in the collection of data the antenna used was nearly isotropic in the horizontal plane. If a non-isotropic antenna had been used all data would also have been dependent upon the antenna pattern in the direction of the source. In the vertical plane the antenna pattern had many lobes since the problem required that it be many wavelengths above ground. A quarter wavelength vertical element over a ground plane was chosen for its simplicity and its ability to meet problem requirements. The ground plane consisted of four aluminum radial elements. The antenna was designed using published curves.[4] The elements were trimmed and the radials bent to tune the antenna to match a 50 ohm transmission line at 149.13 MHz. The final design consisted of an active vertical element 47.65 cm long. The ground plane consisted of four radial elements 47.7 cm long. The radials were bent down 45° from the horizontal. The measured horizontal pattern of the antenna under ideal conditions is shown in Figure 1.

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[4] Jasik, H., Antenna Engineering Handbook, p. 14, McGraw Hill, 1961.

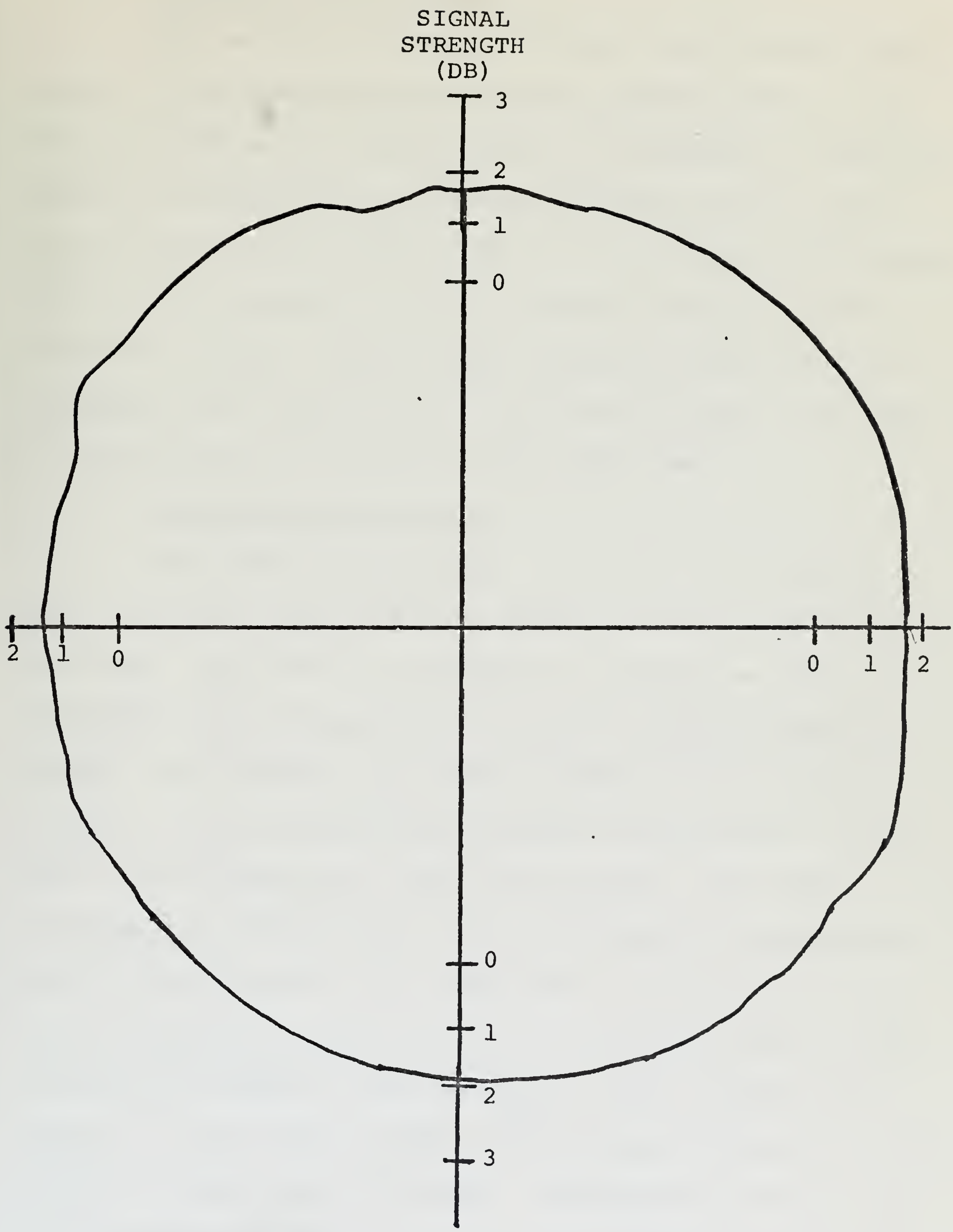

Figure 1. Measured Horizontal Antenna Pattern.

2. <u>Research Vessel Acania</u>

The antenna was mounted aboard the research vessel Acania. The mounting point was the highest point on the ship, 60 feet above the waterline. The Acania is operated under the sponsorship of the Oceanographer of the Navy by a five man civilian crew employed by the Naval Postgraduate School. The vessel is 126 feet overall with a beam of 21 feet 4 inches. Under normal operating conditions it displaces 246.8 gross tons. The Acania's small size made it an excellent platform for this experiment.

3. <u>Recorder and Receiver</u>

The receiving equipment consisted of an AN/URR-27 radio receiver connected to a Hewlett Packard #680 strip recorder. The URR-27 is designed to receive an amplitude modulated voice transmission in the 105-190 MHz frequency range. The receiver was crystal tuned to 149.13 MHz to avoid the drift problems encountered in the manual tuning mode. The transmitted signal was CW only. The basic receiver was modified for this experiment by disconnecting the AVC bus from the "IF" amplifiers. The strip recorder was connected from the AVC bus to an external power supply which was grounded to the receiver. This resulted in an output on the strip recorder that was approximately linearly related to the input CW signal. Calibration curves used with different equipment settings are included in Figure 2.

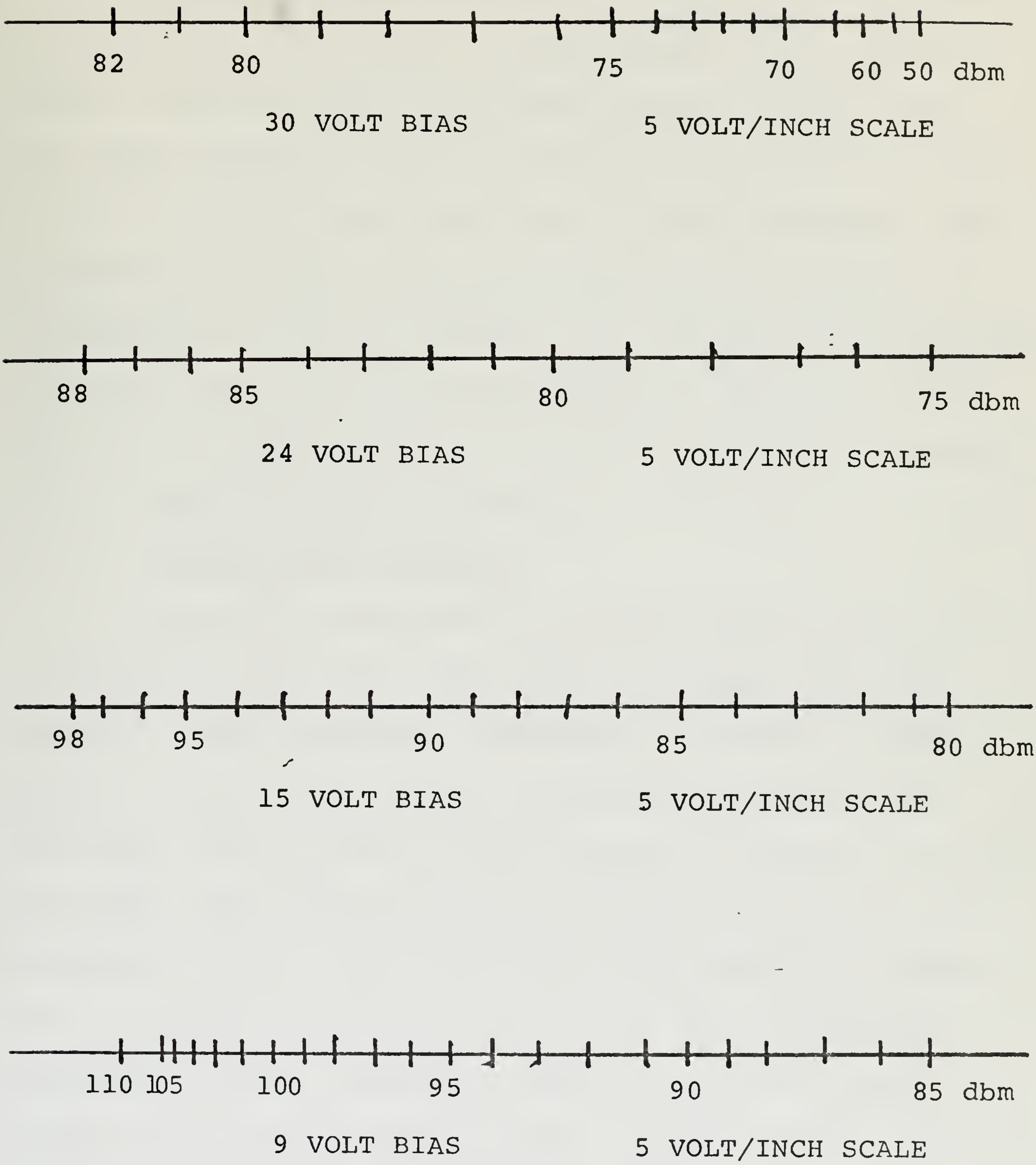

Figure 2. Calibration Curves for Strip Recorder.

B. ANALYSIS OF DATA

1. Form of Output Data

Received signal strength was continuously plotted on the strip recorder as the ship steamed from point to point. Along with the continuous signal strength plot, the ships course and speed, and the direction and distance of the radiating source were periodically recorded. Only a rough estimate of roll and pitch using the ship's inclinometer could be obtained. The average roll and pitch were the least accurate of data taken on each run. The numbers assigned to roll and pitch for a run were estimates of the average values for the run.

2. Interpreting the Data

Since the variations in signal strength were the primary consideration, only amplitude values were taken from the strip recording. Whenever the signal strength graph reversed direction and continued in the opposite direction for at least one half decibel, a signal peak was recorded. The value of one half decibel was chosen since equipment accuracy was limited to this value. All points were recorded with values of either a whole or a half decibel. Figure 3 shows how data was recorded. The numbers next to each peak are the recorded values. Circles indicate variations not recorded since the change was less than one half decibel. No time dependence is included in this procedure. The time between peaks varied from a fraction of a second to several seconds. After this step the

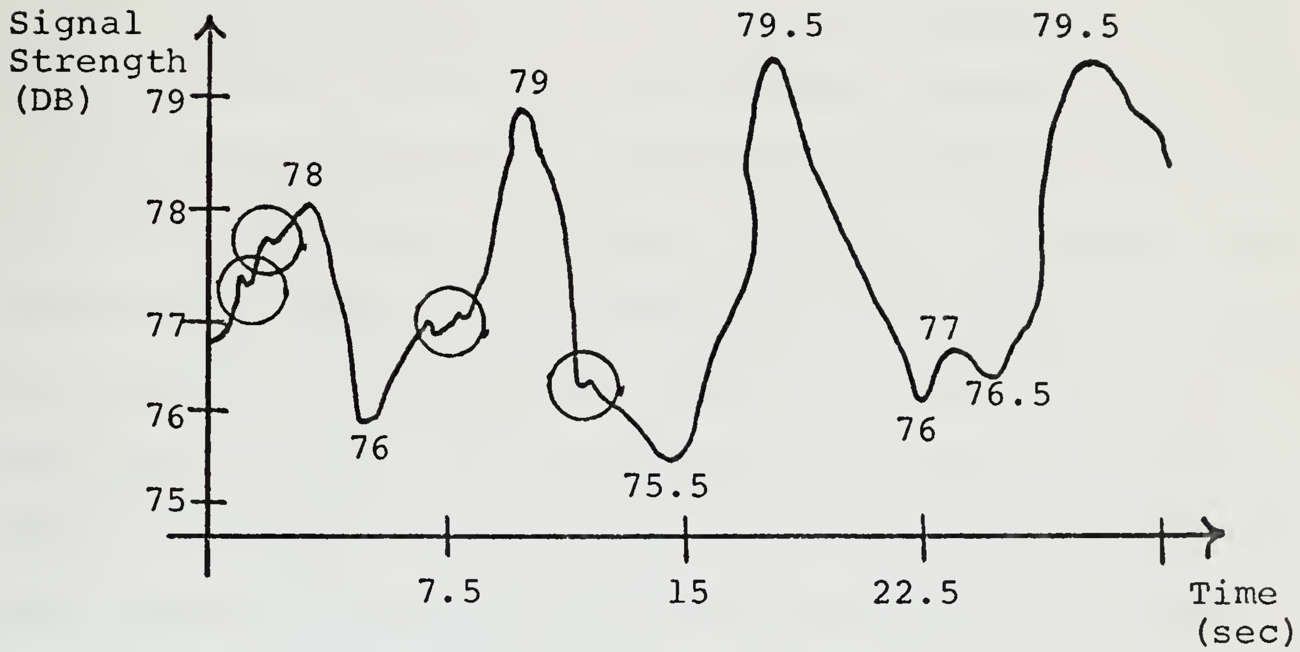

Figure 3. Digitizing the Strip Recorder Plot. Circles indicate variations less than one-half decibel. The numbers on the graph are the recorded values.

data consisted of a number of data points which represent signal strength peaks.

3. Computer Program Distribution

The first analysis of the data points was done by computer program "DISTRIBUTION." The output of this program is an un-normalized discrete probability density function of the signal strength peaks. Figure 4 displays the form of the computer output. Figure 5 is the graphical output. Data pertaining to the run being output appears at the top of the page followed by a listing of the data points taken from the strip chart. The next output is the average and standard deviation of the data points. The average value is subtracted from each data point and these values are quantized. These quantized values are counted and the number of values in each range is output. Since the average and standard deviation of the entire system has already been determined, the positive and negative portions of the graph are then analyzed separately. This allows a comparison of positive and negative swing tendencies. The graphical output of quantized values versus the number of points in that interval demonstrates how the signal peaks were distributed. This plot was used to determine the location of the signal peaks and the variability of the signal strength.

4. Computer Program Variation

The next analysis was done by computer program "VARIATIONS." Computer outputs are contained in

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DISTRIBUTION RUN62 ROLL15 PITCH00
COURSE 160 E&M DIR. 150 DIST  6.30

                               DATA POINTS

74.5    75.5    73.5    75.0    73.5    74.0    75.0    73.5    74.5
73.5    74.0    74.5    74.0    74.5    73.5    75.0    73.5    74.0
73.5    74.5    73.5    75.0    73.5    77.5    76.5    78.0    73.5
75.0    74.0    74.5    74.0

  AVERAGE POWER =   74.5DB       STANDARD DEVIATION =    1.3

  GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

  NORMALIZED POWER, DB                  POINTS AT THAT POWER

          -4.25                                 0.0
          -3.75                                 0.0
          -3.25                                 0.0
          -2.75                                 0.0
          -2.25                                 0.0
          -1.75                                 0.0
          -1.25                                 0.0
          -0.75                                10.0
          -0.25                                 6.0
           0.25                                 6.0
           0.75                                 5.0
           1.25                                 1.0
           1.75                                 0.0
           2.25                                 1.0
           2.75                                 0.0
           3.25                                 1.0
           3.75                                 1.0
           4.25                                 0.0

  NEGATIVE VALUES MEAN          =  -0.78
  POSITIVE VALUES MEAN          =   0.83
  NEGATIVE VARIANCE             =   0.06
  POSITIVE VARIANCE             =   1.28
  NEGATIVE STANDARD DEVIATION   =   0.25
  POSITIVE STANDARD DEVIATION   =   1.13
```

Figure 4. Computer Output "DISTRIBUTION."

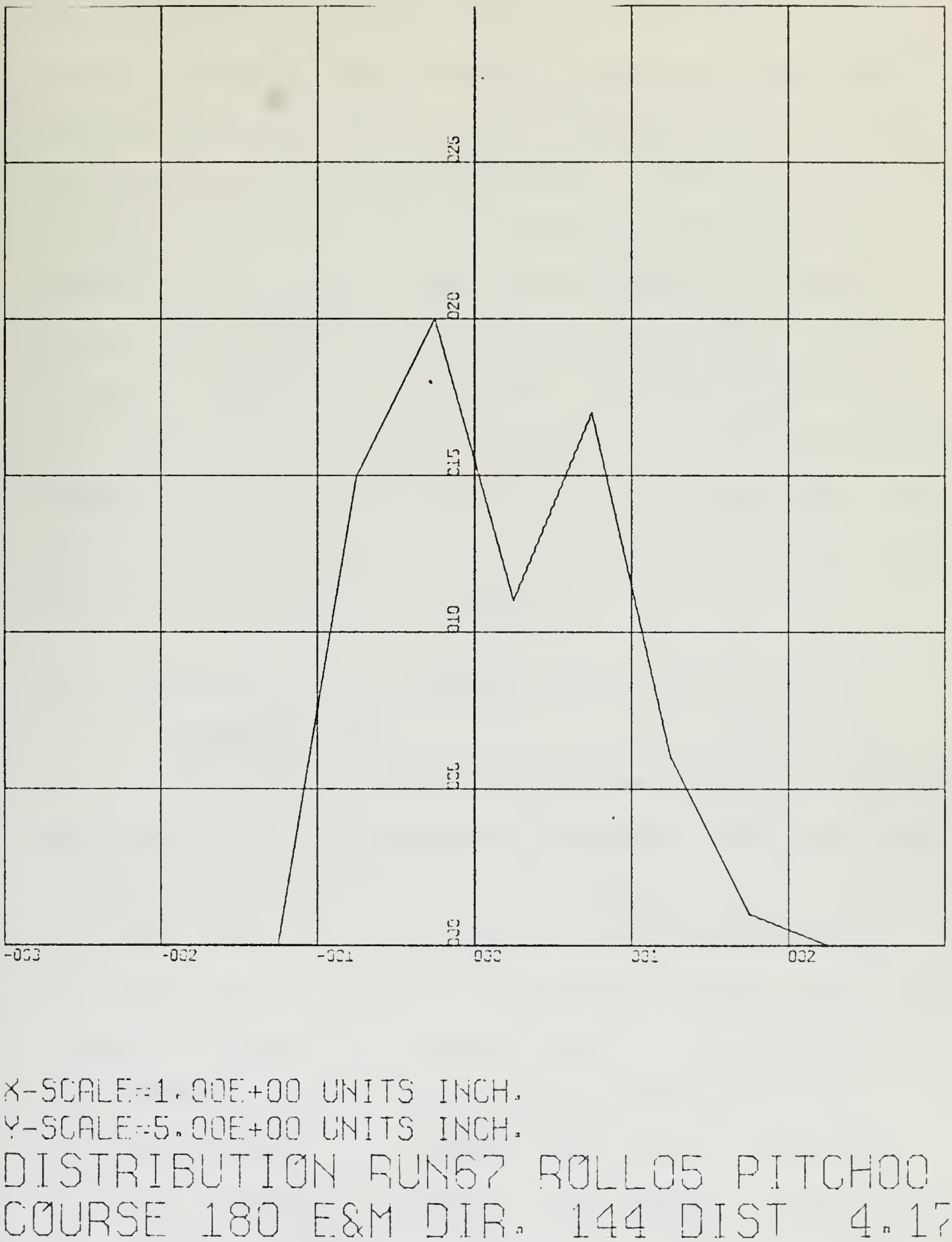


Figure 5. Graphical Output of Computer Program "DISTRIBUTION."

Figure 6 and Figure 7. Graphical output is contained in Figure 8. This computer program is very similar to the previous program. The same data points are input. The program subtracts each data point from the previous point to obtain the peak to peak variation. There is no need to normalize this data since the values do not depend upon absolute signal level. They depend upon the change in signal level. The program next quantizes the values and a graph of this result is output. Thus the location of peak to peak variations is analyzed. Next the distribution function of the peak to peak variations is computed. From this portion a probabilistic estimate of how large a variation can be expected is obtained.

C. SIMULATION OF THE PROBLEM

1. Program Set up

The computer simulation of the problem was programmed for use on the AGT-10 graphics terminals. The basic equations used were taken from two technical reports, "Predicting Long-Term Operational Parameters of High-Frequency Sky Wave Telecommunication Systems" (ESSA-ERL-110-ITS78) and "Power Gains for Antennas Over Lossy Plane Ground" (ESSA-ERL-104-ITS74). The programs predict how antenna patterns will vary as a ship rolls and pitches over a smooth sea surface. The first parameter that must be input on the graphics terminal is the antenna type. A vertical monopole, inverted L, sloping long wire, vertical monopole with ground screen, vertical half rhombic or a dipole may be chosen. Next antenna length,

```
VARIATIONS    RUN54 ROLL06 PITCH03
COURSE 000 E&M DIR. 149 DIST 10.94

                          VARIATIONS
-4.0   2.5  -1.5   2.0  -2.5   1.5  -3.5  -1.5   5.0  -3.5
 2.0  -2.5   4.5  -2.5   2.0  -3.0   2.5  -2.5   1.0  -2.5
 2.5  -1.5   2.0  -2.5   3.5  -3.0   1.0  -2.0   2.5  -1.0
 1.0  -2.5   3.0  -3.5   2.5  -1.5   1.5  -1.0   2.5  -3.0
 2.0  -1.0   1.0  -1.5   1.0  -1.5   3.0  -2.5   2.5  -2.0
 4.5  -4.5   2.5  -3.0   1.5  -1.5   1.0  -2.0   5.5  -5.0
 3.5  -2.5   1.0  -1.5   3.5  -5.5   3.5  -3.5   5.5  -6.0

AVE. VARIATION = -0.1DB      STANDARD DEVIATION =   8.4

GRAPHED DATA IS, VARIATIONS  VS. POINTS AT THAT VALUE

     VARIATIONS, DB                  POINTS AT THAT VALUE
         -6.25                              0.0
         -5.75                              1.0
         -5.25                              1.0
         -4.75                              1.0
         -4.25                              1.0
         -3.75                              1.0
         -3.25                              4.0
         -2.75                              4.0
         -2.25                              9.0
         -1.75                              3.0
         -1.25                              8.0
         -0.75                              3.0
         -0.25                              0.0
          0.25                              0.0
          0.75                              0.0
          1.25                              7.0
          1.75                              3.0
          2.25                              5.0
          2.75                              8.0
          3.25                              2.0
          3.75                              4.0
          4.25                              0.0
          4.75                              2.0
          5.25                              1.0
          5.75                              2.0
          6.25                              0.0

NEGITIVE VALUES MEAN          =   -2.62
POSITIVE VALUES MEAN          =    2.54
NEGITIVE VARIANCE             =    1.53
POSITIVE VARIANCE             =    1.72
NEGITIVE STANDARD DEVIATION   =    1.24
POSITIVE STANDARD DEVIATION   =    1.31
```

Figure 6. Computer Output "VARIATIONS."

VARIATIONS RUN54 ROLL06 PITCH03
COURSE 000 E&M DIR. 149 DIST 10.94

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBIBILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
6.00	1.000
5.50	0.957
5.00	0.929
4.50	0.886
4.00	0.871
3.50	0.800
3.00	0.714
2.50	0.543
2.00	0.343
1.50	0.257
1.00	0.043
0.50	0.0

Figure 7. Probability Output of Computer Program "VARIATIONS."

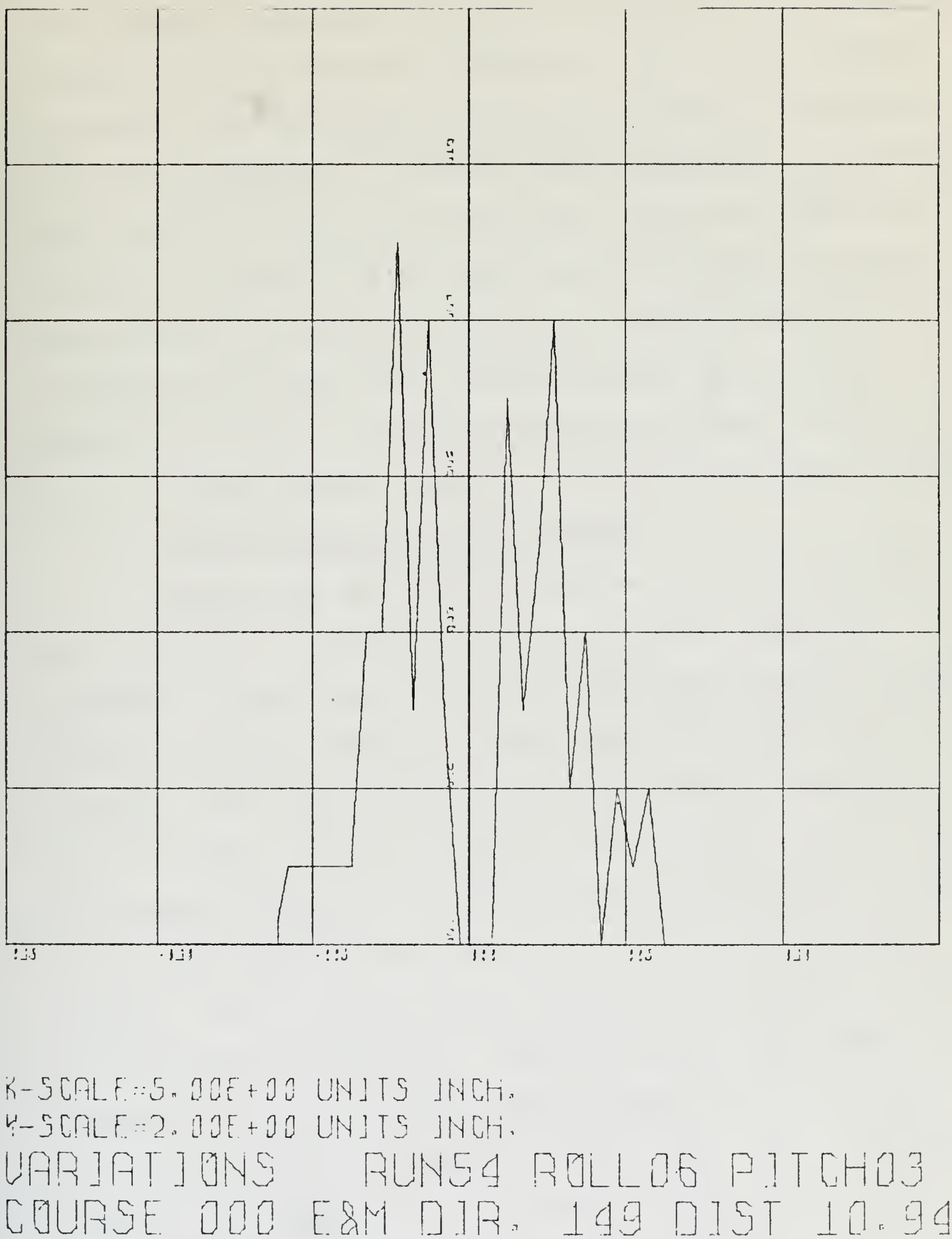


Figure 8. Graphical Output of Computer Program "VARIATIONS."

height above the sea, and orientation on the ship are input. Other inputs establish frequency, direction of the incoming signal, and environmental constants. The program outputs a plot of the vertical and horizontal antenna patterns at the point designated, incoming signal strength, and maximum gain of the antenna in that position. The sea state input and the direction of sea input determine maximum roll and pitch angles. The ship rolls from an upright position, to a maximum roll and pitch, through upright to the other maximum, and back to upright in thirty six equal intervals. Data is output for the antenna orientation on each interval.

2. Use of Program in this Problem

Because of the way the program equations are set up, the vertical monopole over ground plane cannot be elevated to any height above the surface of the sea. Therefore the present problem was simulated using the dipole antenna. This approximation was made since a vertical monopole over a perfect ground is essentially a center fed dipole when the image of the monopole is considered. Thus the actual problem would be a dipole sixty feet over the surface, and its image sixty feet below the surface if the ground plane were perfect. Major problems occur when the antenna is exactly upright. The program blows up at the boundary conditions. This is why the zero roll zero pitch condition was avoided in the output. This is also why output values were much higher in the zero roll runs.

IV. EXPERIMENTAL RESULTS

A. STRIP RECORDER PLOT

The strip recorder plot of received signal strength provided interesting data even before numbers were considered. Figure 9 shows signal variations over a choppy sea with no large swells. Figure 10 shows signal variations over a sea with large swells but little choppiness. Figure 11 shows both large swells and choppiness. In all three cases the signal strength graphs resembled the surface of the sea for the condition being observed.

B. DISTRIBUTIONAL ANALYSIS

The distributional analysis conformed quite well to the general theory proposed. In most cases the received signal was characterized by a gradual increase to a peak, followed by a decrease to approximately the mean value of incoming signal, followed by another peak and a gradual decrease. There were definitely two intervals between which the signal strength swung most frequently. The gradual decrease on both sides of the peaks further shows the large variation with a small variable factor possibly caused by the randomness of the sea. This variable factor could also be attributed to the fact that on any run the ship would not roll to the same angle every time. The run might be estimated to have a 5° roll overall, but any

ANTENNA SIMULATION

```
LENGTH OF ANTENNA      =    .95 METERS
HEIGHT OF ANTENNA      =   18.2 METERS
PHI OF ANTENNA         =    000 DEGREES RELATIVE
THETA OF ANTENNA       =    000 DEGREES RELATIVE
FREQUENCY              =  149.0 MHZ
EPSILON                =   80.0
SIGMA                  =    5.0
PHI OF PLOT            =    306 DEGREES RELATIVE
THETA OF PLOT          =    089 DEGREES RELATIVE
SEA STATE              =      2
DIRECTION OF SEA       =    018 DEGREES RELATIVE
```

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
.9	.0	4.875
1.7	.0	1.452
2.5	.0	1.490
3.2	.0	2.809
3.8	.0	3.353
4.3	.0	2.852
4.6	.0	2.319
4.9	.0	2.058
4.9	.0	1.989
4.9	.0	2.058
4.6	.0	2.319
4.3	.0	2.852
3.8	.0	3.353
3.2	.0	2.809
2.5	.0	1.490
1.7	.0	1.452
.9	.0	4.875
-.9	.0	5.080
-1.7	.0	1.592
-2.5	.0	1.416
-3.2	.0	2.594
-3.8	.0	3.332
-4.3	.0	3.054
-4.6	.0	2.564
-4.9	.0	2.275
-4.9	.0	2.190
-4.9	.0	2.275
-4.6	.0	2.564
-4.3	.0	3.054
-3.8	.0	3.332
-3.2	.0	2.594
-2.5	.0	1.416
-1.7	.0	1.592
-.9	.0	5.080

AVERAGE VALUE = 2.66 DB

Figure 9. Output of Computer Program "ANTENNA SIMULATION."

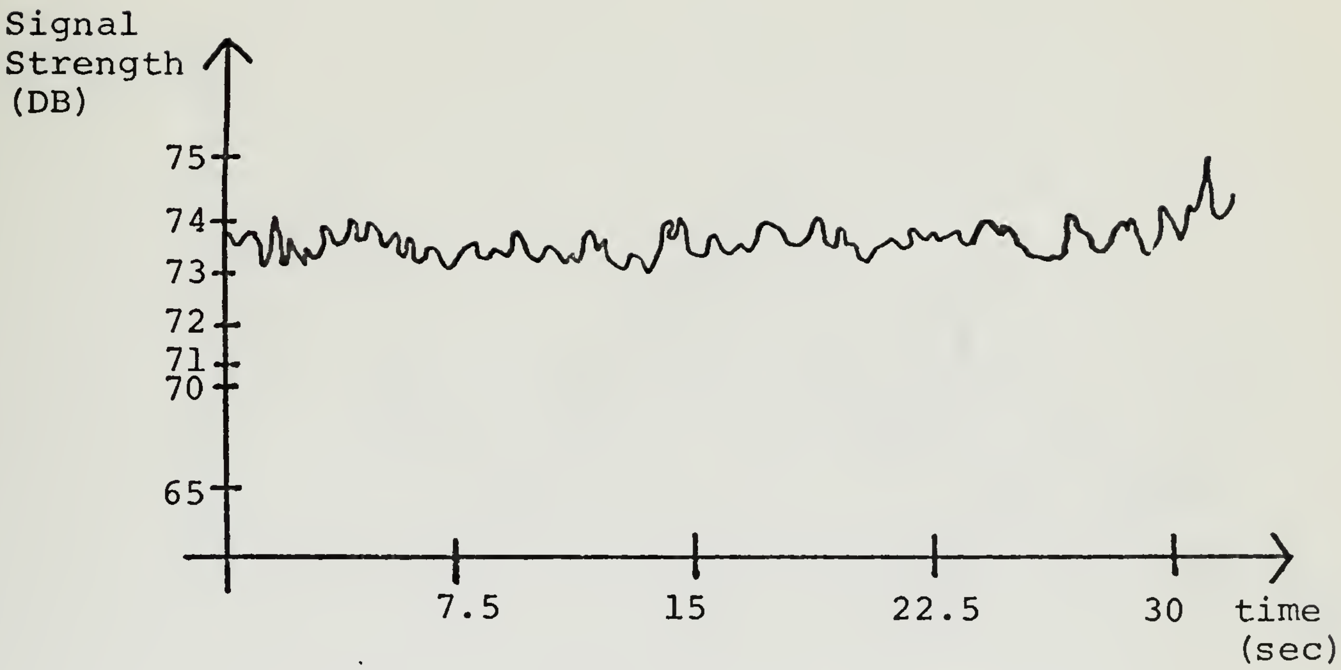


Figure 10. Signal Variations Over a Choppy Sea with No Large Swells.

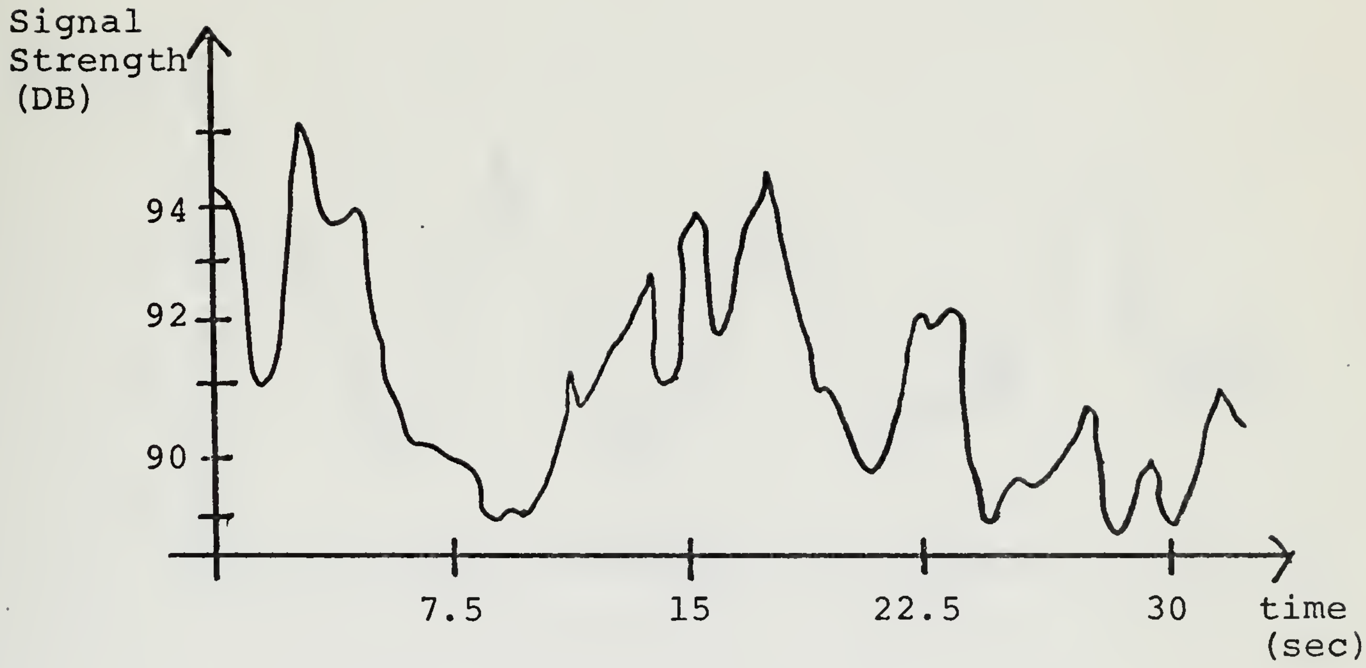


Figure 11. Signal Variations Over a Sea with Large Swells but No Choppiness.

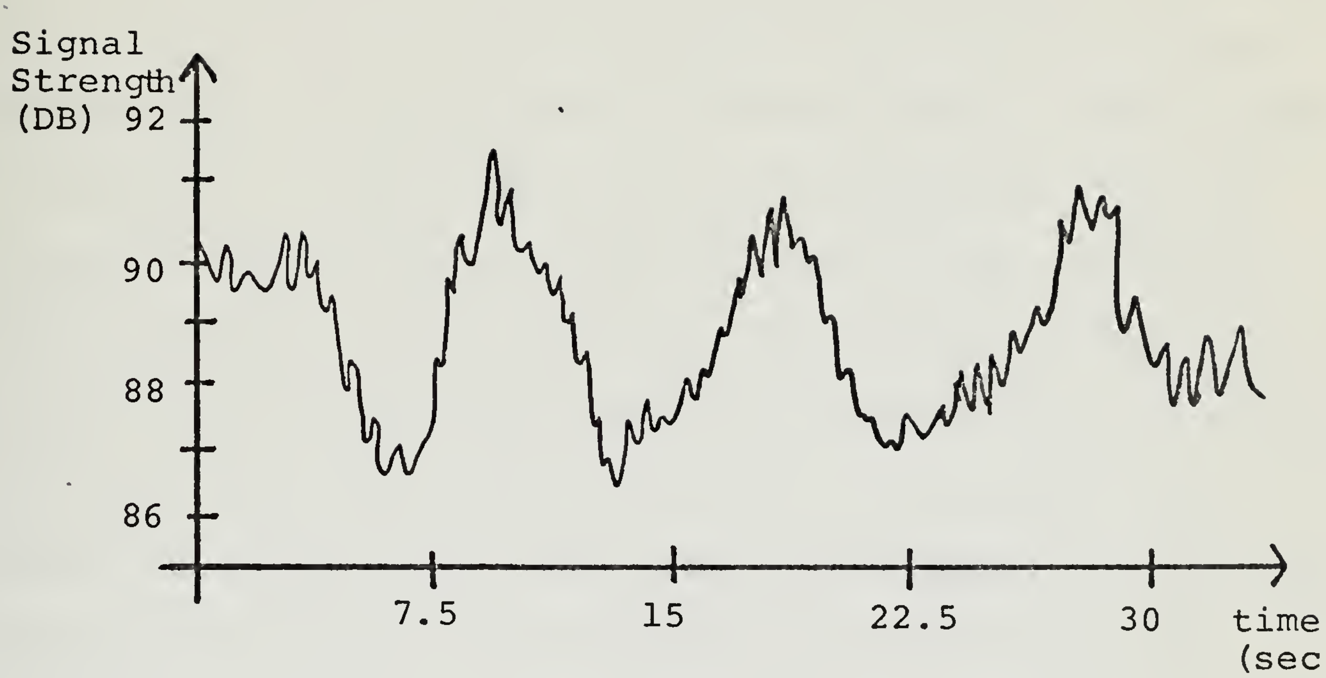


Figure 12. Signal Variations over a Choppy Sea with Large Swells.

individual roll might be 5.2° or 3° or 7°. Runs were not extremely long so that roll and pitch could be updated more often, but they could not be made very short because small sample sections can lead to very erroneous conclusions. By looking only at the distributional analysis no relationship between roll and pitch conditions is immediately obvious. Peaks occur on each plot, but they are unrelated to roll and pitch. Mean and variance also show no logical progression. But this kind of correspondence cannot really be expected. Signal strength is too dependent upon the direction from which the electromagnetic waves originate. When receiving from a point directly astern and taking 5° rolls the variations might be fairly small. This in no way indicates that when taking 5° rolls and receiving from abeam the signal will still vary only slightly. Therefore when looking only at the distributional analysis, the validity of each run is the question. To answer this question many runs under the same conditions on different days are necessary. Due to the long time necessary to hand digitize the data this problem could not be undertaken.

C. VARIATIONAL ANALYSIS

The results of the variational analysis follow closely the results of the distributional analysis. The same two peak behavior shows up on the graphs, with the same type gradual decrease around the peaks. The average value of the data points is always very close to zero. This shows that the runs were short enough so that the average signal

strength was constant. Again because of the number of variable factors involved, neither the peaks or the probability computations show any easily definable trend. Also the lack of many runs under the same conditions leaves the validity of the data in question. The shape of the output graphs conforms well to the proposed theory however. It is only the degree of accuracy of the numbers, and the predictability of the peaks that is in doubt.

D. SIMULATION ANALYSIS

The computer simulation of the problem was an attempt to tie all the previous analysis together. The program did not include the randomness of the sea, but it was hoped the program could predict where the peaks in distributional and variational analysis should occur. The program failed to accomplish this task. As the ship rolled through a complete cycle, the program predicted several peaks in signal strength. One of the peaks corresponded to the major peak in the actual data, but with that many peaks, one of them had to match. According to the simulation, three equal peaks should show on each side of the mean. From these results the smooth surface approximation seems doomed to failure. The rough surface seems to smooth out the antenna pattern so that instead of going from a maximum to a null as the ship rolls, the pattern goes from a lesser maximum to a minimum higher than a null. Because of this, on the average the signal varies between two points. The rough surface makes the result more predictable in a more

random way, more predictable since there is only one average value to which the signal varies, but more random since all values around that average are possible.

E. SHORTCOMINGS OF ANALYSIS

The two major drawbacks in this analysis were the accuracy of the measurements, especially roll and pitch, and the necessity to hand digitize the data. Roll and pitch values were estimates, and the accuracy of signal strength measurements was limited to $\pm$ .25 DB. If on two different runs the peaks were in the same spot on the computer outputs, the peaks could be as much as .5 DB apart in reality. The lack of self-digitizing equipment prevented many runs from being analyzed. This also prevented any attempt at a frequency analysis of the data. Further analysis of the problem should include many runs under identical conditions instead of runs under many conditions. In this way the predictability of signal variations can be established. Once this is accomplished, different runs can be added in search of a method to predict the result.

V. CONCLUSIONS

As a ship rolls and pitches, signal strength will, on the average, vary between two values. The magnitude of these variations is dependent first of all upon sea state, since this determines the height of the large ocean swells. The variations also depend upon wind speed since this determines choppiness. A third dominant factor is the relative direction from which the signal is being received. A smooth surface approximation is not justified since the rough surface reflections have a smoothing effect on the antenna pattern which modifies the magnitude and the frequency of the variations.

APPENDIX A

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	036 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	039 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
1.7	.9	1.380
3.4	1.7	3.231
5.0	2.5	1.965
6.5	3.2	2.670
7.7	3.8	2.494
8.7	4.3	2.041
9.5	4.7	2.364
9.9	4.9	2.606
10.1	5.0	2.653
9.9	4.9	2.606
9.5	4.7	2.364
8.7	4.3	2.041
7.7	3.8	2.494
6.5	3.2	2.670
5.0	2.5	1.965
3.4	1.7	3.231
1.7	.9	1.380
-1.7	-.9	1.495
-3.4	-1.7	3.035
-5.0	-2.5	2.109
-6.5	-3.2	2.431
-7.7	-3.8	2.675
-8.7	-4.3	2.051
-9.5	-4.7	2.141
-9.9	-4.9	2.381
-10.1	-5.0	2.461
-9.9	-4.9	2.381
-9.5	-4.7	2.141
-8.7	-4.3	2.051
-7.7	-3.8	2.675
-6.5	-3.2	2.431
-5.0	-2.5	2.109
-3.4	-1.7	3.035
-1.7	-.9	1.495

AVERAGE VALUE = 2.33 DB

DISTRIBUTION RUN 8 ROLL10 PITCH05
COURSE 180 E&M DIR. 144 DIST 4.17

DATA POINTS

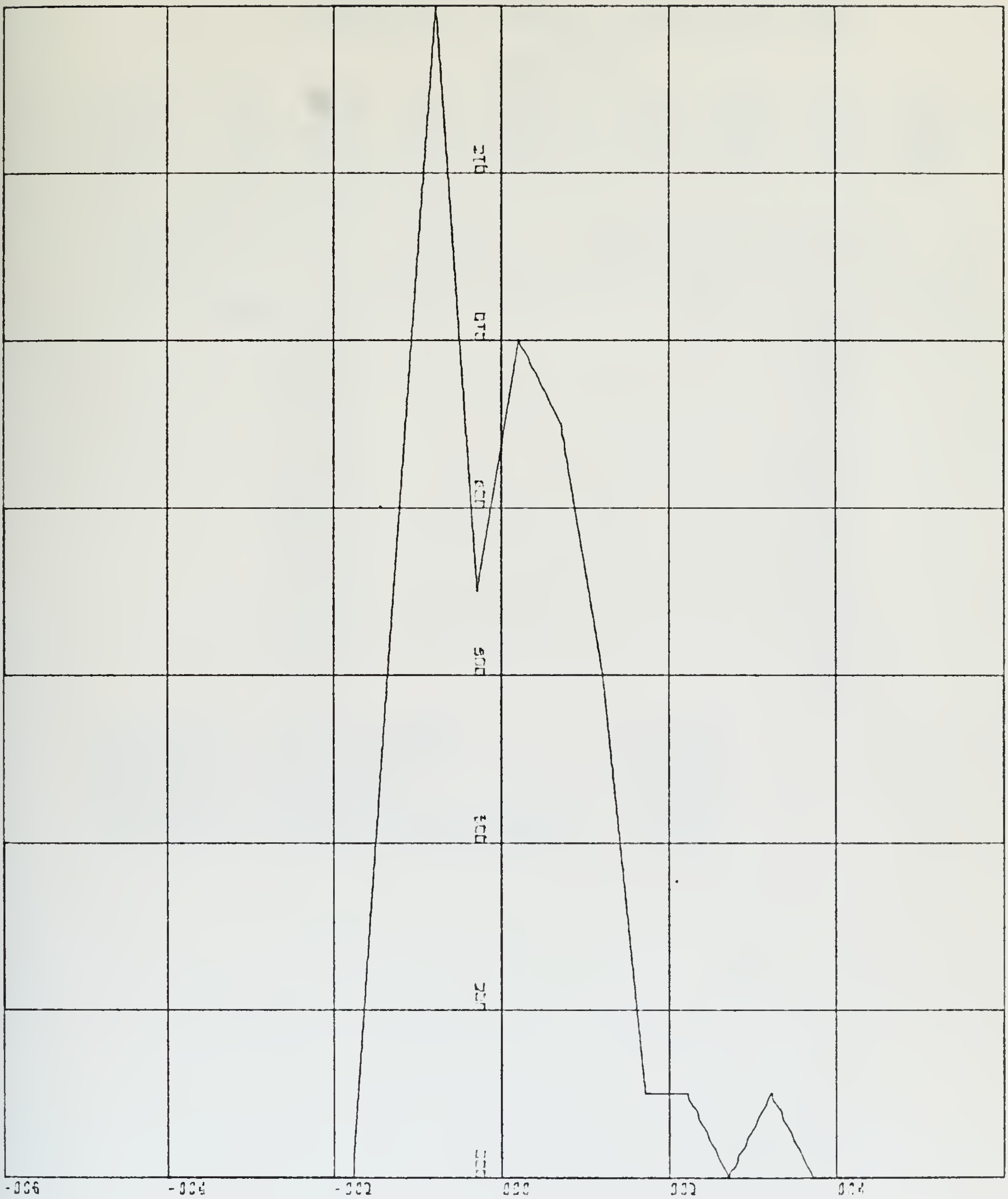
75.0	73.5	74.5	73.0	75.0	72.5	74.0	72.5	74.0
72.5	74.0	73.0	74.0	72.5	74.0	72.5	74.0	73.0
74.0	73.0	74.0	73.5	74.5	73.5	74.5	73.5	74.5
73.5	74.5	73.5	77.0	73.5	74.5	73.0	76.0	73.0
74.0	73.0	75.5	73.0	75.0	73.0	75.0	72.5	75.0
73.0	75.0	73.0	74.5	73.0	74.0	72.5	74.5	73.0
74.5	73.0							

AVERAGE POWER = 73.8DB STANDARD DEVIATION = 1.0

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-4.25	0.0
-3.75	0.0
-3.25	0.0
-2.75	0.0
-2.25	0.0
-1.75	0.0
-1.25	7.0
-0.75	14.0
-0.25	7.0
0.25	10.0
0.75	9.0
1.25	6.0
1.75	1.0
2.25	1.0
2.75	0.0
3.25	1.0
3.75	0.0
4.25	0.0

NEGATIVE VALUES MEAN = -0.80
POSITIVE VALUES MEAN = 0.80
NEGATIVE VARIANCE = 0.13
POSITIVE VARIANCE = 0.49
NEGATIVE STANDARD DEVIATION = 0.36
POSITIVE STANDARD DEVIATION = 0.70



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=2.00E+00 UNITS INCH.
DISTRIBUTION RUN 8 ROLL10 PITCH05
COURSE 180 F&M DIR. 144 DIST 4.17

VARIATIONS RUN 8 ROLL10 PITCH05
COURSE 180 E&M DIR. 144 DIST 4.17

VARIATIONS

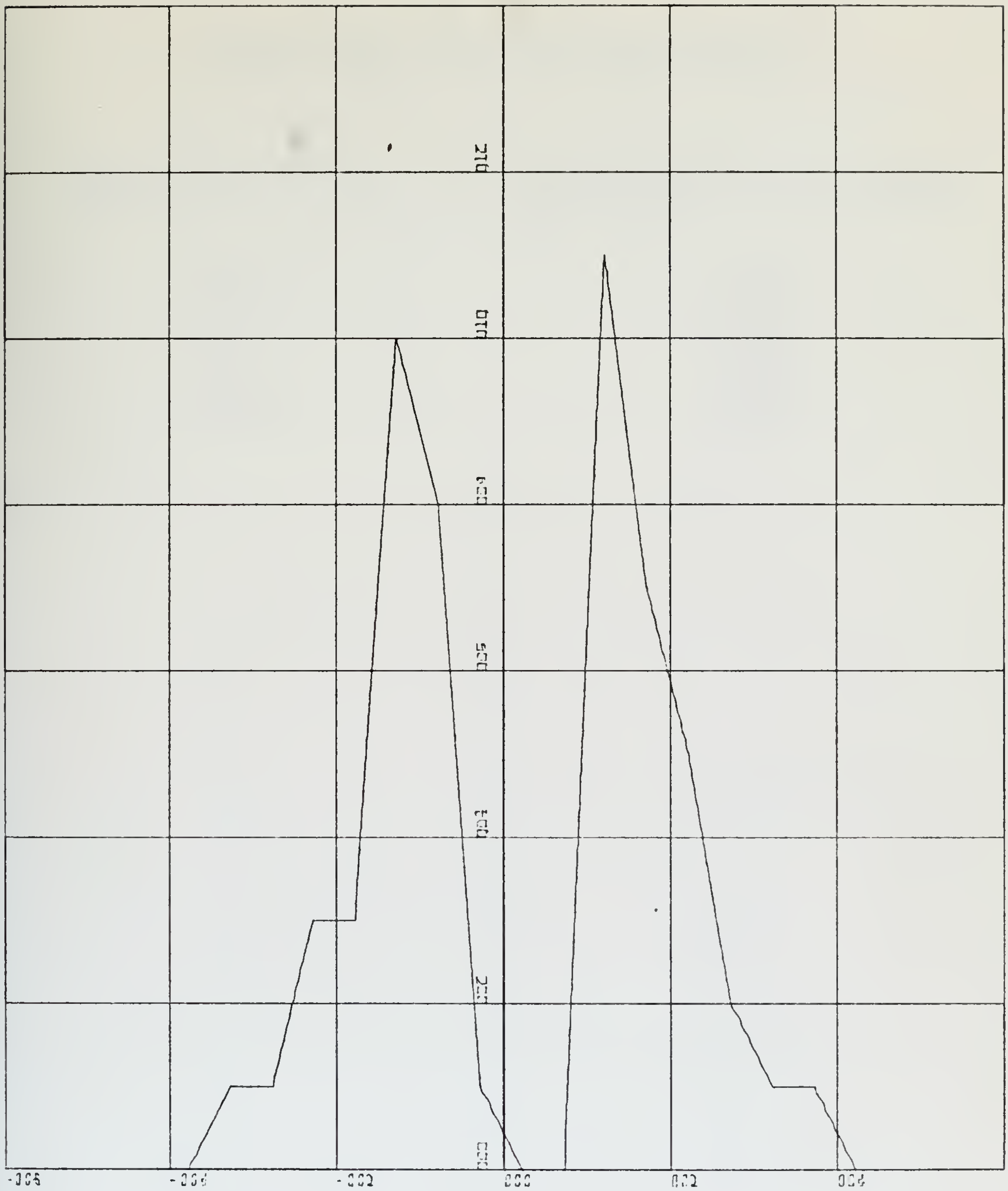
-1.5	1.0	-1.5	2.0	-2.5	1.5	-1.5	1.5	-1.5	1.5
-1.0	1.0	-1.5	1.5	-1.5	1.5	-1.0	1.0	-1.0	1.0
-0.5	1.0	-1.0	1.0	-1.0	1.0	-1.0	1.0	-1.0	3.5
-3.5	1.0	-1.5	3.0	-3.0	1.0	-1.0	2.5	-2.5	2.0
-2.0	2.0	-2.5	2.5	-2.0	2.0	-2.0	1.5	-1.5	1.0
-1.5	2.0	-1.5	1.5						

AVE. VARIATION = -0.0DB STANDARD DEVIATION = 3.1

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-4.25	0.0
-3.75	0.0
-3.25	1.0
-2.75	1.0
-2.25	3.0
-1.75	3.0
-1.25	10.0
-0.75	8.0
-0.25	1.0
0.25	0.0
0.75	0.0
1.25	11.0
1.75	7.0
2.25	5.0
2.75	2.0
3.25	1.0
3.75	1.0
4.25	0.0

NEGATIVE VALUES MEAN = -1.61
POSITIVE VALUES MEAN = 1.59
NEGATIVE VARIANCE = 0.49
POSITIVE VARIANCE = 0.46
NEGATIVE STANDARD DEVIATION = 0.70
POSITIVE STANDARD DEVIATION = 0.68



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=2.00E+00 UNITS INCH.
VARIATIONS RUN 8 ROLL10 PITCH05
COURSE 180 E&M DIR. 144 DIST 4.17

VARIATIONS RUN 8 ROLL10 PITCH05
COURSE 180 E&M DIR. 144 DIST 4.17

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
4.00	1.000
3.50	0.981
3.00	0.944
2.50	0.889
2.00	0.741
1.50	0.556
1.00	0.167
0.50	0.019

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	126 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	039 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
1.7	.9	1.377
3.4	1.7	3.218
5.0	2.5	1.937
6.5	3.2	2.623
7.7	3.8	2.425
8.7	4.3	1.954
9.5	4.7	2.261
9.9	4.9	2.492
10.1	5.0	2.536
9.9	4.9	2.492
9.5	4.7	2.261
8.7	4.3	1.954
7.7	3.8	2.425
6.5	3.2	2.623
5.0	2.5	1.937
3.4	1.7	3.218
1.7	.9	1.377
-1.7	-.9	1.490
-3.4	-1.7	3.018
-5.0	-2.5	2.076
-6.5	-3.2	2.376
-7.7	-3.8	2.598
-8.7	-4.3	1.953
-9.5	-4.7	2.027
-9.9	-4.9	2.255
-10.1	-5.0	2.332
-9.9	-4.9	2.255
-9.5	-4.7	2.027
-8.7	-4.3	1.953
-7.7	-3.8	2.598
-6.5	-3.2	2.376
-5.0	-2.5	2.076
-3.4	-1.7	3.018
-1.7	-.9	1.490

AVERAGE VALUE = 2.27 DB

DISTRIBUTION RUN 9 ROLL10 PITCH05
COURSE 270 E&M DIR. 144 DIST 4.17

DATA POINTS

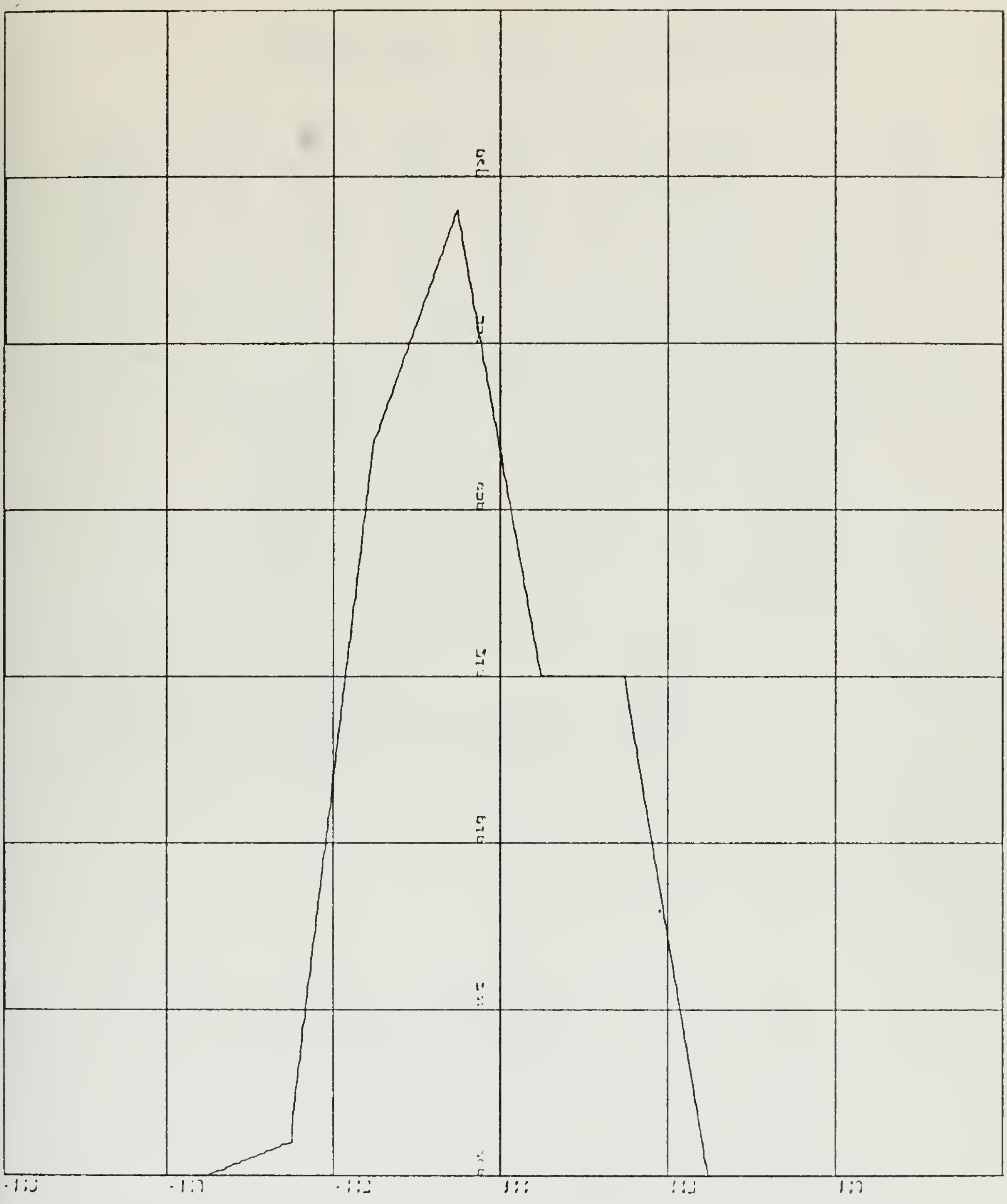
73.0	72.0	73.0	72.5	73.0	72.5	73.0	72.5	73.0
72.5	73.0	72.5	73.0	72.5	73.0	72.5	73.0	72.5
73.0	72.5	73.0	72.5	73.5	72.5	73.5	72.5	74.0
72.5	74.0	72.5	73.5	72.5	73.5	72.5	73.5	72.5
73.5	72.5	73.5	72.5	74.0	73.0	74.0	73.0	74.0
73.0	73.5	73.0	73.5	72.5	74.0	73.0	74.0	73.0
74.0	73.0	74.0	73.0	74.0	73.0	74.0	73.0	74.0
73.0	74.0	73.0	74.0	73.0	73.5	73.0	73.5	73.0
73.5	73.0	73.5	73.0	73.5	73.0	74.0	72.5	73.5
72.5								

AVERAGE POWER = 73.1DB   STANDARD DEVIATION = 0.3

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-2.25	0.0
-1.75	0.0
-1.25	1.0
-0.75	22.0
-0.25	29.0
0.25	15.0
0.75	15.0
1.25	0.0
1.75	0.0
2.25	0.0

NEGATIVE VALUES MEAN = -0.36
POSITIVE VALUES MEAN = 0.62
NEGATIVE VARIANCE = 0.07
POSITIVE VARIANCE = 0.06
NEGATIVE STANDARD DEVIATION = 0.27
POSITIVE STANDARD DEVIATION = 0.25



X-SCALE=1.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
DISTRIBUTION RUN 9 ROLL10 PITCH05
COURSE 270 E&M DIR. 144 DIST 4.17

VARIATIONS RUN 9 ROLL10 PITCH05
COURSE 270 E&M DIR. 144 DIST 4.17

VARIATIONS

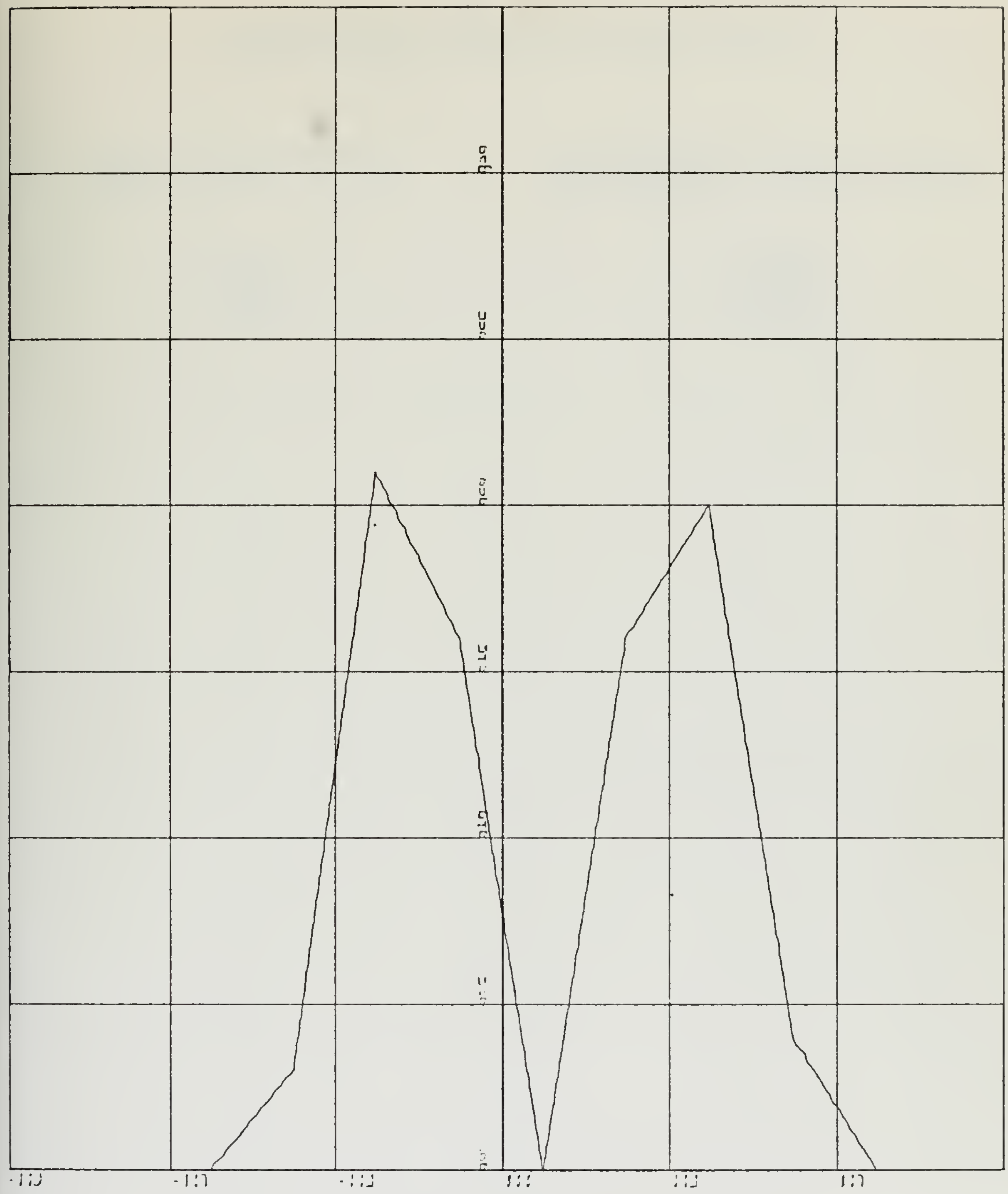
-1.0	1.0	-0.5	0.5	-0.5	0.5	-0.5	0.5	-0.5	0.5
-0.5	0.5	-0.5	0.5	-0.5	0.5	-0.5	0.5	-0.5	0.5
-0.5	1.0	-1.0	1.0	-1.0	1.5	-1.5	1.5	-1.5	1.0
-1.0	1.0	-1.0	1.0	-1.0	1.0	-1.0	1.0	-1.0	1.5
-1.0	1.0	-1.0	1.0	-1.0	0.5	-0.5	0.5	-1.0	1.5
-1.0	1.0	-1.0	1.0	-1.0	1.0	-1.0	1.0	-1.0	1.0
-1.0	1.0	-1.0	1.0	-1.0	1.0	-1.0	0.5	-0.5	0.5
-0.5	0.5	-0.5	0.5	-0.5	0.5	-0.5	1.0	-1.5	1.0

AVE. VARIATION = 0.0DB STANDARD DEVIATION = 0.8

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-2.25	0.0
-1.75	0.0
-1.25	3.0
-0.75	21.0
-0.25	16.0
0.25	0.0
0.75	16.0
1.25	20.0
1.75	4.0
2.25	0.0

NEGATIVE VALUES MEAN = -0.84
POSITIVE VALUES MEAN = 0.85
NEGATIVE VARIANCE = 0.09
POSITIVE VARIANCE = 0.11
NEGATIVE STANDARD DEVIATION = 0.31
POSITIVE STANDARD DEVIATION = 0.32



X-SCALE=1.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
VARIATIONS RUN 9 ROLL10 PITCH05
COURSE 270 E&M DIR. 144 DIST 4.17

VARIATIONS RUN 9 ROLL10 PITCH05
COURSE 270 E&M DIR. 144 DIST 4.17

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
2.00	1.000
1.50	0.950
1.00	0.662
0.50	0.200

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	189 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	039 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
1.7	1.4	1.379
3.4	2.7	3.231
5.0	4.0	1.980
6.5	5.1	2.677
7.7	6.1	2.547
8.7	6.9	2.079
9.5	7.5	2.383
9.9	7.9	2.636
10.1	8.0	2.693
9.9	7.9	2.636
9.5	7.5	2.383
8.7	6.9	2.079
7.7	6.1	2.547
6.5	5.1	2.677
5.0	4.0	1.980
3.4	2.7	3.231
1.7	1.4	1.379
-1.7	-1.4	1.501
-3.4	-2.7	3.047
-5.0	-4.0	2.145
-6.5	-5.1	2.459
-7.7	-6.1	2.752
-8.7	-6.9	2.135
-9.5	-7.5	2.201
-9.9	-7.9	2.437
-10.1	-8.0	2.520
-9.9	-7.9	2.437
-9.5	-7.5	2.201
-8.7	-6.9	2.135
-7.7	-6.1	2.752
-6.5	-5.1	2.459
-5.0	-4.0	2.145
-3.4	-2.7	3.047
-1.7	-1.4	1.501

AVERAGE VALUE = 2.36 DB

DISTRIBUTION RUN 10 ROLL08 PITCH05
COURSE 334 E&M DIR. 145 DIST 4.58

DATA POINTS

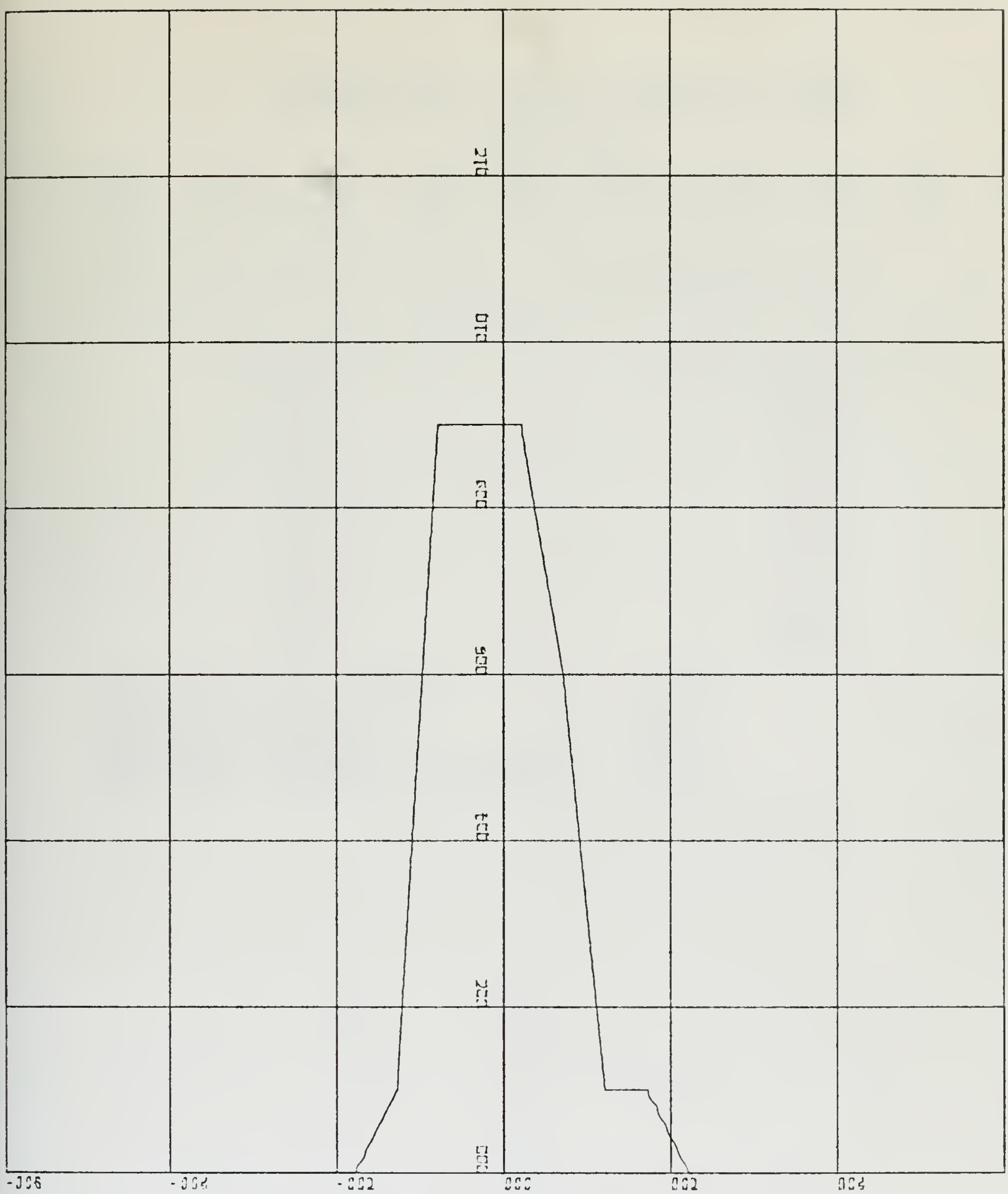
74.0	73.0	74.0	73.0	73.5	73.0	74.0	73.0	74.0
73.5	74.0	72.5	74.5	73.0	74.0	73.0	74.5	73.5
75.0	73.5	74.5	73.5	74.0	73.0	74.0	73.0	74.5
73.0	75.5	73.5	74.5	73.5	74.0	73.5	74.5	73.5

AVERAGE POWER = 73.7DB STANDARD DEVIATION = 0.4

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-2.25	0.0
-1.75	0.0
-1.25	1.0
-0.75	9.0
-0.25	9.0
0.25	9.0
0.75	6.0
1.25	1.0
1.75	1.0
2.25	0.0

NEGATIVE VALUES MEAN = -0.53
POSITIVE VALUES MEAN = 0.59
NEGATIVE VARIANCE = 0.09
POSITIVE VARIANCE = 0.19
NEGATIVE STANDARD DEVIATION = 0.30
POSITIVE STANDARD DEVIATION = 0.43



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=2.00E+00 UNITS INCH.
DISTRIBUTION RUN 10 ROLL08 PITCH05
COURSE 334 E&M DIR. 145 DIST 4.58

VARIATIONS RUN 10 ROLL08 PITCH05
COURSE 334 E&M DIR. 145 DIST 4.58

VARIATIONS

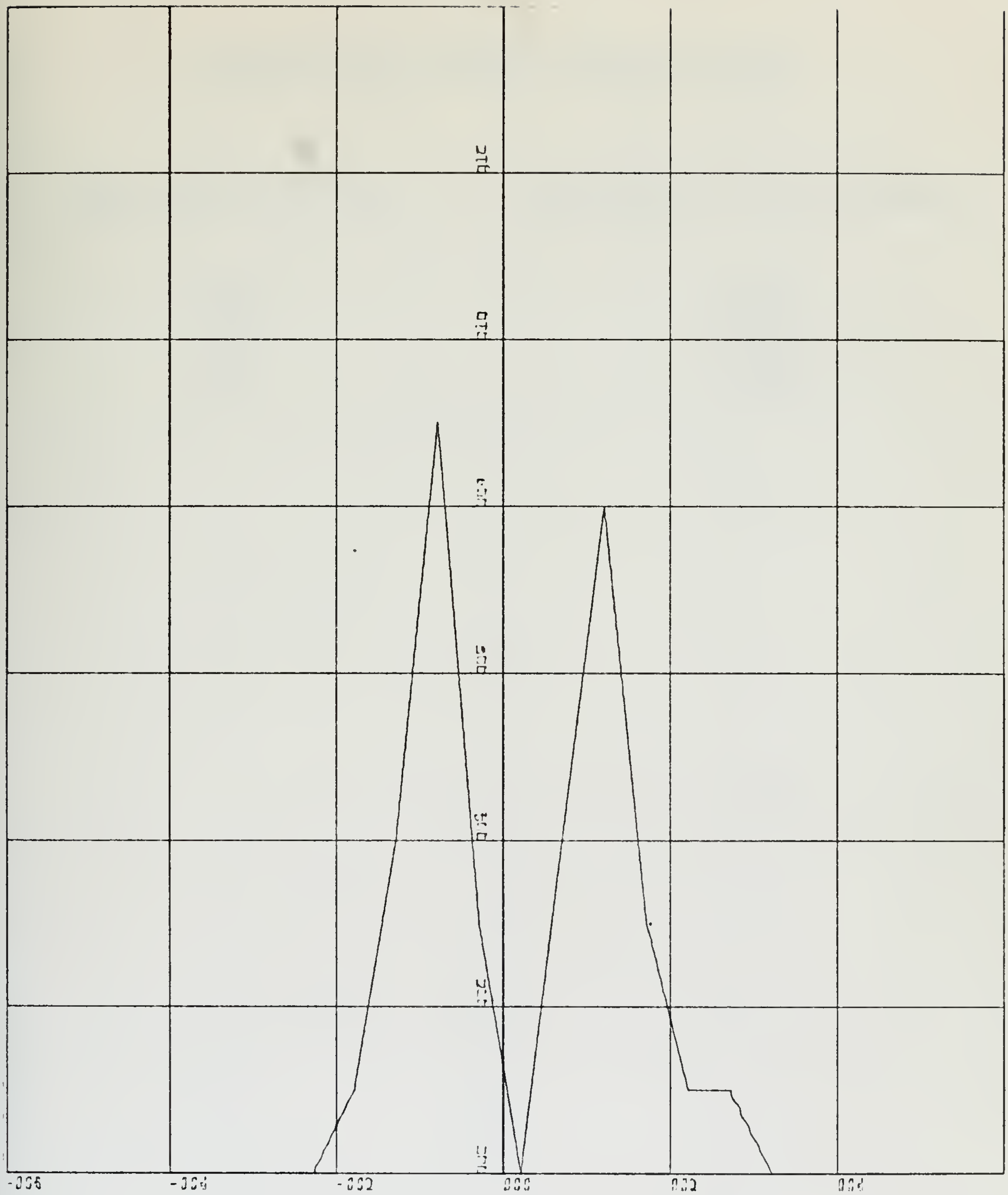
-1.0	1.0	-1.0	0.5	-0.5	1.0	-1.0	1.0	-0.5	0.5
-1.5	2.0	-1.5	1.0	-1.0	1.5	-1.0	1.5	-1.5	1.0
-1.0	0.5	-1.0	1.0	-1.0	1.5	-1.5	2.5	-2.0	1.0
-1.0	0.5	-0.5	1.0						

AVE. VARIATION = 0.0DB STANDARD DEVIATION = 1.5

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-3.25	0.0
-2.75	0.0
-2.25	0.0
-1.75	1.0
-1.25	4.0
-0.75	9.0
-0.25	3.0
0.25	0.0
0.75	4.0
1.25	8.0
1.75	3.0
2.25	1.0
2.75	1.0
3.25	0.0

NEGATIVE VALUES MEAN = -1.09
POSITIVE VALUES MEAN = 1.12
NEGATIVE VARIANCE = 0.16
POSITIVE VARIANCE = 0.30
NEGATIVE STANDARD DEVIATION = 0.40
POSITIVE STANDARD DEVIATION = 0.55



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=2.00E+00 UNITS INCH.
VARIATIØNS RUN 10 RØLL08 PITCH05
CØURSE 334 E&M DIR. 145 DIST 4.58

VARIATIONS   RUN 10 ROLL08 PITCH05
COURSE 334 E&M DIR. 145 DIST 4.58

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
3.00	1.000
2.50	0.971
2.00	0.941
1.50	0.824
1.00	0.471
0.50	0.088

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	186 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	5
DIRECTION OF SEA	=	007 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
.8	2.6	4.967
1.7	5.2	1.477
2.4	7.5	1.364
3.1	9.7	2.547
3.7	11.6	3.223
4.2	13.1	2.912
4.6	14.2	2.407
4.8	14.9	2.100
4.9	15.1	2.007
4.8	14.9	2.100
4.6	14.2	2.407
4.2	13.1	2.912
3.7	11.6	3.223
3.1	9.7	2.547
2.4	7.5	1.364
1.7	5.2	1.477
.8	2.6	4.967
-.8	-2.6	5.168
-1.7	-5.2	1.618
-2.4	-7.5	1.298
-3.1	-9.7	2.320
-3.7	-11.6	3.122
-4.2	-13.1	3.043
-4.6	-14.2	2.634
-4.8	-14.9	2.337
-4.9	-15.1	2.239
-4.8	-14.9	2.337
-4.6	-14.2	2.634
-4.2	-13.1	3.043
-3.7	-11.6	3.122
-3.1	-9.7	2.320
-2.4	-7.5	1.298
-1.7	-5.2	1.618
-.8	-2.6	5.168

AVERAGE VALUE = 2.63 DB

DISTRIBUTION RUN11 ROLL05 PITCH15
COURSE 334 E&M DIR. 148 DIST 5.85

DATA POINTS

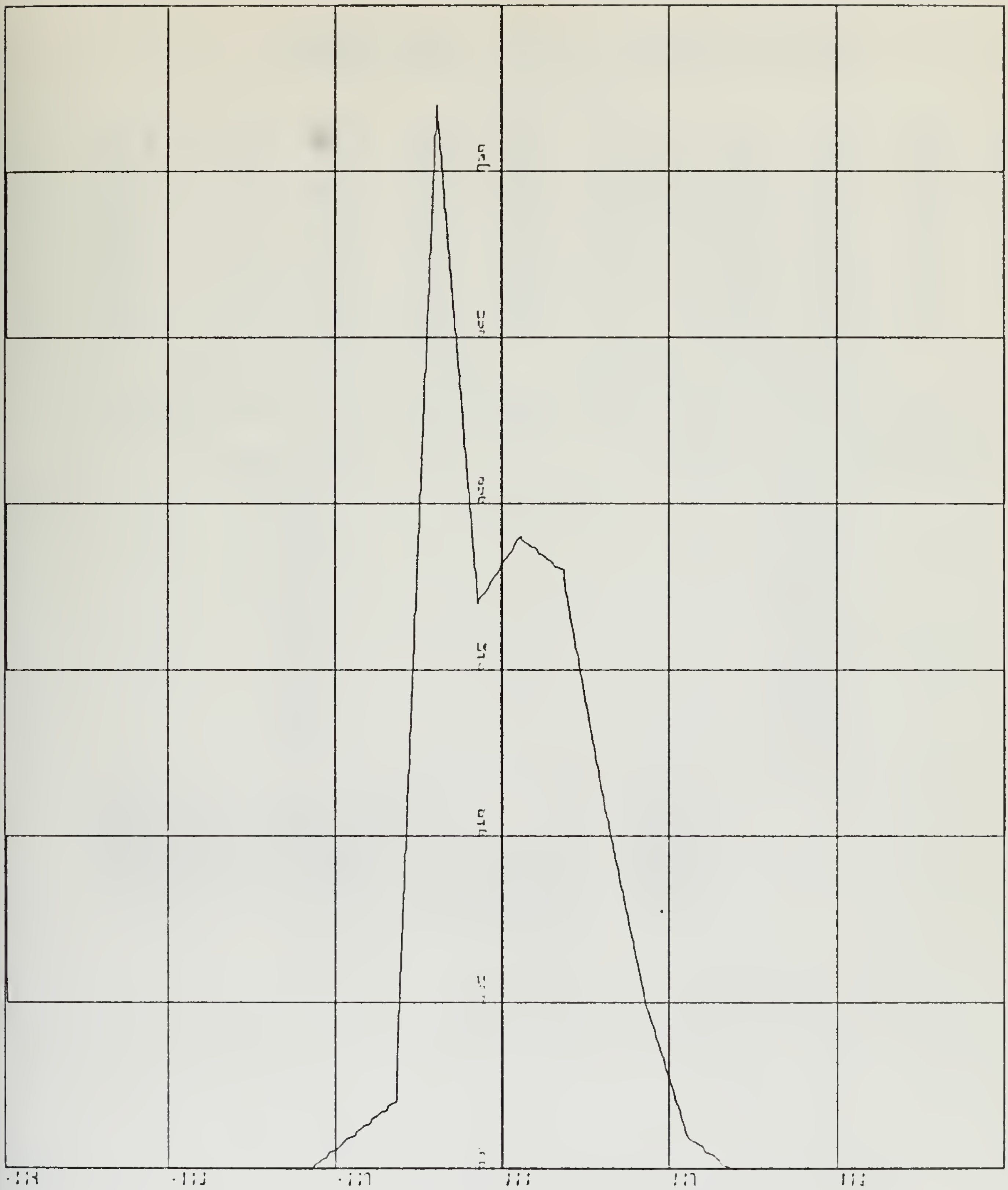
75.0	74.0	76.0	74.5	76.5	74.0	76.0	74.0	76.5
74.0	75.5	74.0	76.0	74.0	75.0	74.0	75.0	73.5
74.5	74.0	74.5	73.0	75.0	74.0	75.5	74.0	75.5
74.0	75.0	74.0	75.5	74.0	75.0	74.0	76.0	74.0
76.5	74.5	76.0	75.0	76.0	75.0	76.0	75.5	77.0
74.5	75.5	74.5	75.5	74.5	75.5	74.5	75.5	74.5
75.5	74.5	75.5	74.0	75.5	74.0	76.0	74.0	75.0
74.0	75.0	74.0	75.0	74.0	75.0	74.0	75.0	74.0
75.0	73.5	75.0	74.0	75.0	74.0	74.5	74.0	75.5
74.0	75.5	74.5	76.5	74.0	76.5	74.5	75.5	74.0
76.0	74.0	75.0	74.0	76.0	74.5	76.0	74.5	75.5
74.0	75.5	75.0	75.5	74.5	75.0	74.5		

AVERAGE POWER = 74.8DB   STANDARD DEVIATION = 0.7

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-3.25	0.0
-2.75	0.0
-2.25	0.0
-1.75	1.0
-1.25	2.0
-0.75	32.0
-0.25	17.0
0.25	19.0
0.75	18.0
1.25	11.0
1.75	5.0
2.25	1.0
2.75	0.0
3.25	0.0

NEGATIVE VALUES MEAN = -0.72
POSITIVE VALUES MEAN = 0.70
NEGATIVE VARIANCE = 0.10
POSITIVE VARIANCE = 0.28
NEGATIVE STANDARD DEVIATION = 0.31
POSITIVE STANDARD DEVIATION = 0.53



K-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
DISTRIBUTION RUN11 ROLL05 PITCH15
COURSE 334 E&M DIR. 148 DIST 5.85

VARIATIONS   RUN11 ROLL05 PITCH15
COURSE 334 E&M DIR. 148 DIST 5.85

VARIATIONS

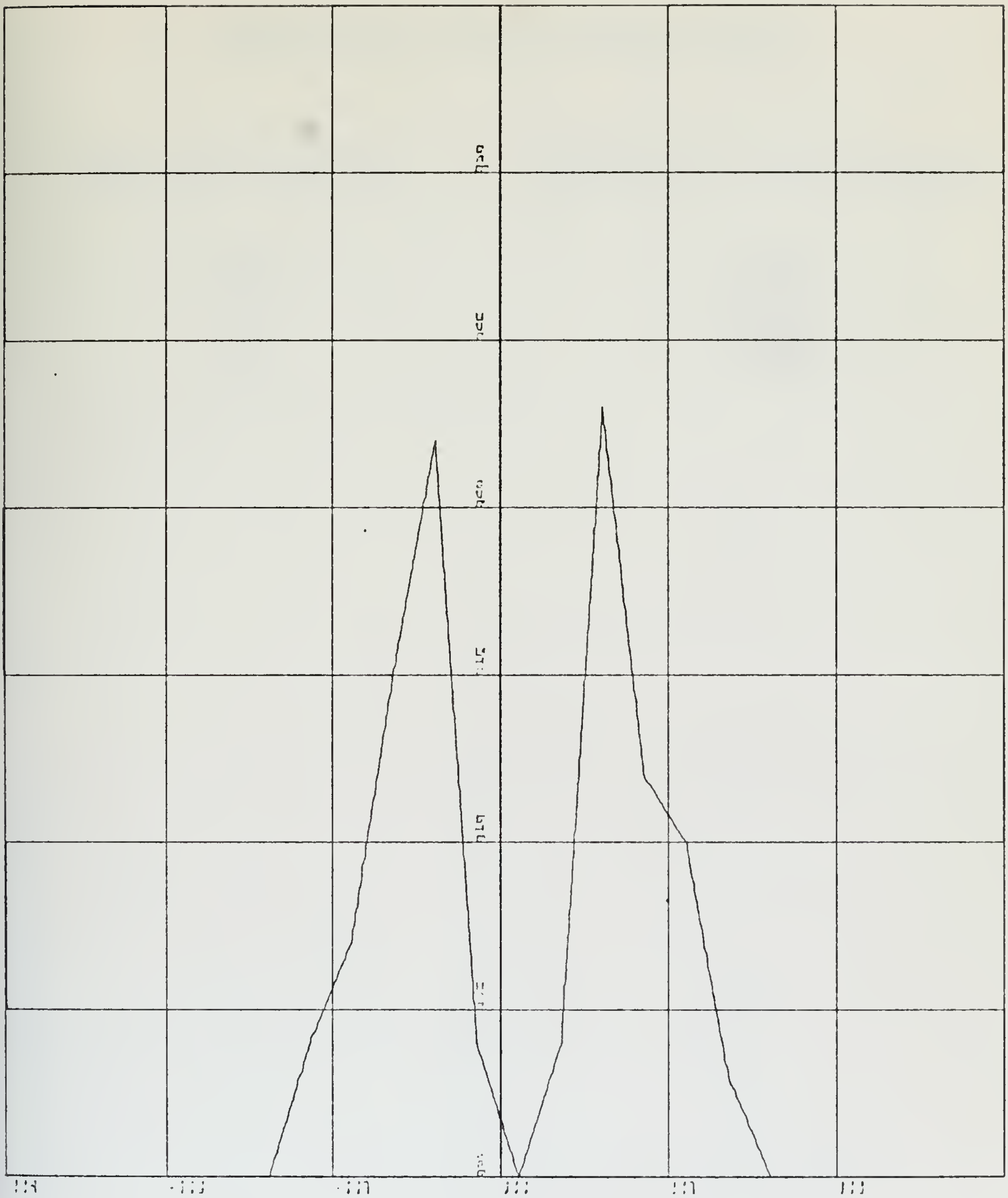
-1.0	2.0	-1.5	2.0	-2.5	2.0	-2.0	2.5	-2.5	1.5
-1.5	2.0	-2.0	1.0	-1.0	1.0	-1.5	1.0	-0.5	0.5
-1.5	2.0	-1.0	1.5	-1.5	1.5	-1.5	1.0	-1.0	1.5
-1.5	1.0	-1.0	2.0	-2.0	2.5	-2.0	1.5	-1.0	1.0
-1.0	1.0	-0.5	1.5	-2.5	1.0	-1.0	1.0	-1.0	1.0
-1.0	1.0	-1.0	1.0	-1.0	1.0	-1.5	1.5	-1.5	2.0
-2.0	1.0	-1.0	1.0	-1.0	1.0	-1.0	1.0	-1.0	1.0
-1.0	1.0	-1.5	1.5	-1.0	1.0	-1.0	0.5	-0.5	1.5
-1.5	1.5	-1.0	2.0	-2.5	2.5	-2.0	1.0	-1.5	2.0
-2.0	1.0	-1.0	2.0	-1.5	1.5	-1.5	1.0	-1.5	1.5
-0.5	0.5	-1.0	0.5						

AVE. VARIATION = -0.0DB   STANDARD DEVIATION =   2.1

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-3.25	0.0
-2.75	0.0
-2.25	4.0
-1.75	7.0
-1.25	15.0
-0.75	22.0
-0.25	4.0
0.25	0.0
0.75	4.0
1.25	23.0
1.75	12.0
2.25	10.0
2.75	3.0
3.25	0.0

NEGATIVE VALUES MEAN = -1.36
POSITIVE VALUES MEAN = 1.36
NEGATIVE VARIANCE = 0.28
POSITIVE VARIANCE = 0.28
NEGATIVE STANDARD DEVIATION = 0.53
POSITIVE STANDARD DEVIATION = 0.53



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
VARIATIONS RUN11 ROLL05 PITCH15
COURSE 334 E&M DIR. 140 DIST 5.85

VARIATIONS RUN11 ROLL05 PITCH15
COURSE 334 E&M DIR. 148 DIST 5.85

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
3.00	1.000
2.50	0.971
2.00	0.837
1.50	0.654
1.00	0.288
0.50	0.038

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	184 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	5
DIRECTION OF SEA	=	007 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
.8	2.6	4.967
1.7	5.2	1.477
2.4	7.5	1.364
3.1	9.7	2.547
3.7	11.6	3.224
4.2	13.1	2.913
4.6	14.2	2.408
4.8	14.9	2.101
4.9	15.1	2.008
4.8	14.9	2.101
4.6	14.2	2.408
4.2	13.1	2.913
3.7	11.6	3.224
3.1	9.7	2.547
2.4	7.5	1.364
1.7	5.2	1.477
.8	2.6	4.967
-.8	-2.6	5.168
-1.7	-5.2	1.618
-2.4	-7.5	1.298
-3.1	-9.7	2.320
-3.7	-11.6	3.122
-4.2	-13.1	3.043
-4.6	-14.2	2.634
-4.8	-14.9	2.337
-4.9	-15.1	2.239
-4.8	-14.9	2.337
-4.6	-14.2	2.634
-4.2	-13.1	3.043
-3.7	-11.6	3.122
-3.1	-9.7	2.320
-2.4	-7.5	1.298
-1.7	-5.2	1.618
-.8	-2.6	5.168

AVERAGE VALUE = 2.63 DB

DISTRIBUTION RUN11AROLL05 PITCH15
COURSE 334 E&M DIR. 150 DIST 6.67

DATA POINTS

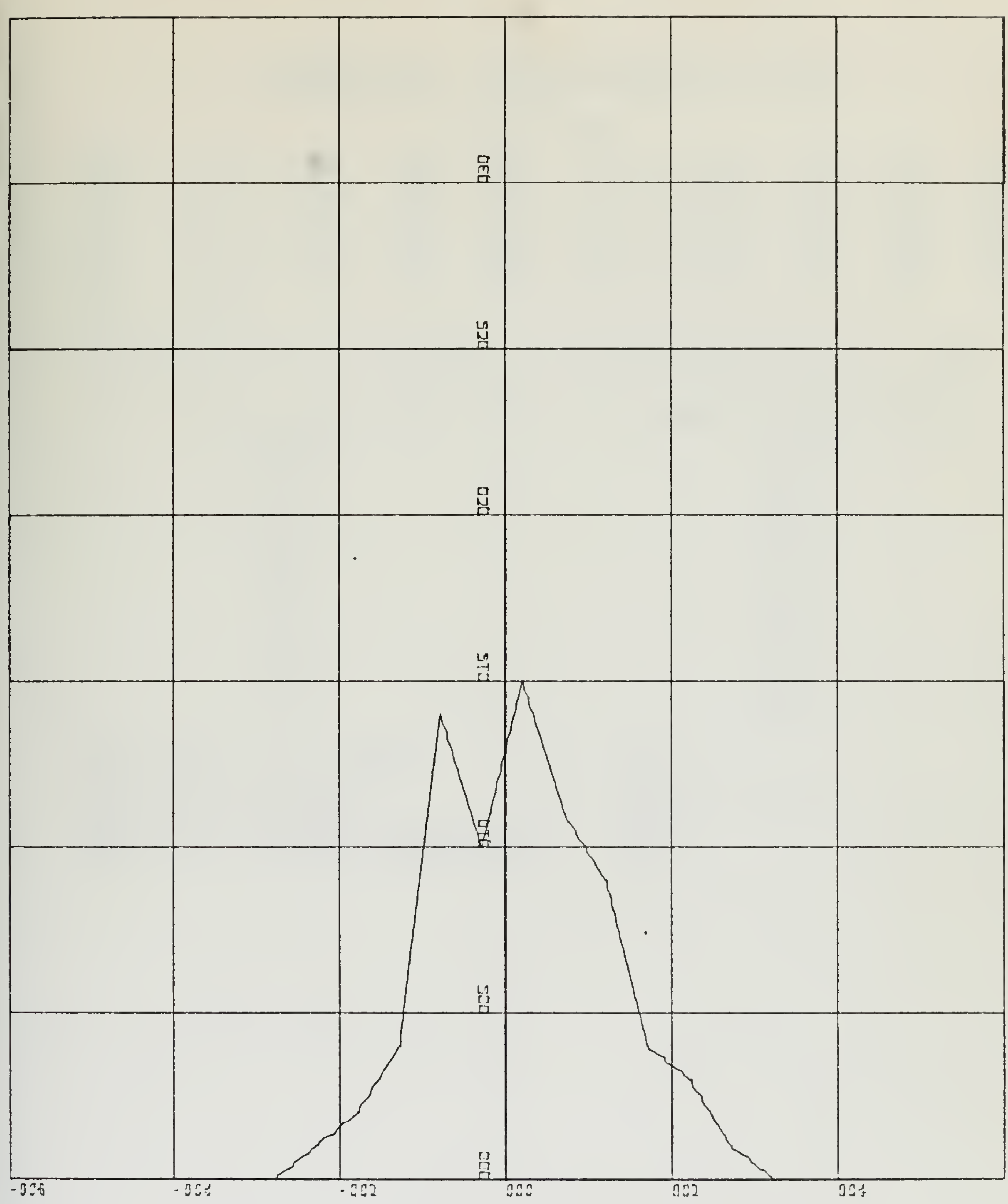
76.0	75.5	77.0	75.5	76.0	74.5	77.5	75.0	77.5
76.5	77.5	75.0	76.5	75.5	77.5	76.0	77.0	75.5
77.0	76.0	77.0	76.0	78.0	76.0	77.5	76.5	77.0
76.5	79.0	76.0	77.0	76.5	77.0	76.0	78.5	77.0
78.0	76.0	78.0	77.5	77.5	76.0	78.0	77.0	79.5
77.5	78.0	76.0	77.0	76.5	78.5	77.0	77.5	76.0
77.0	76.5	79.0	77.5	79.0	76.5	77.5	76.5	78.0
77.0	78.0	76.0	78.0	77.0	78.5	76.5	78.5	77.0
78.0	76.0							

AVERAGE POWER = 77.0DB STANDARD DEVIATION = 1.1

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-3.25	0.0
-2.75	0.0
-2.25	1.0
-1.75	2.0
-1.25	4.0
-0.75	14.0
-0.25	10.0
0.25	15.0
0.75	11.0
1.25	9.0
1.75	4.0
2.25	3.0
2.75	1.0
3.25	0.0

NEGATIVE VALUES MEAN = -0.98
POSITIVE VALUES MEAN = 0.71
NEGATIVE VARIANCE = 0.26
POSITIVE VARIANCE = 0.46
NEGATIVE STANDARD DEVIATION = 0.51
POSITIVE STANDARD DEVIATION = 0.68



K-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
DISTRIBUTION RUN11AROLLOS PITCH15
COURSE 334 E&M DIR. 150 DIST 6.67

VARIATIONS RUN11AROLL05 PITCH15
COURSE 334 E&M DIR. 150 DIST 6.67

VARIATIONS

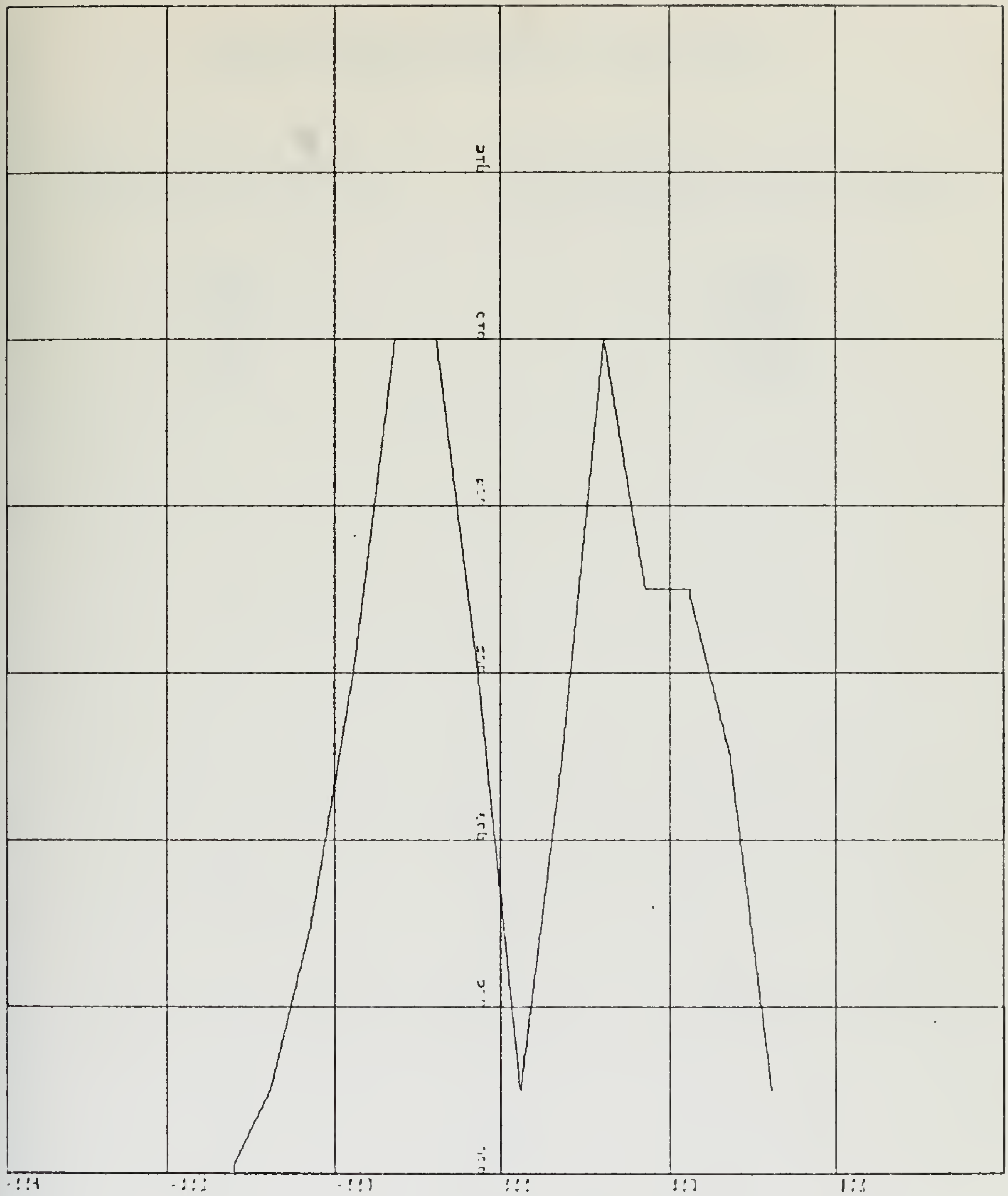
-0.5	1.5	-1.5	0.5	-1.5	3.0	-2.5	2.5	-1.0	1.0
-2.5	1.5	-1.0	2.0	-1.5	1.0	-1.5	1.5	-1.0	1.0
-1.0	2.0	-2.0	1.5	-1.0	0.5	-0.5	2.5	-3.0	1.0
-0.5	0.5	-1.0	2.5	-1.5	1.0	-2.0	2.0	-0.5	0.0
-1.5	2.0	-1.0	2.5	-2.0	0.5	-2.0	1.0	-0.5	2.0
-1.5	0.5	-1.5	1.0	-0.5	2.5	-1.5	1.5	-2.5	1.0
-1.0	1.5	-1.0	1.0	-2.0	2.0	-1.0	1.5	-2.0	2.0
-1.5	1.0								

AVE. VARIATION = 0.0DB STANDARD DEVIATION = 2.5

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-3.25	0.0
-2.75	1.0
-2.25	3.0
-1.75	6.0
-1.25	10.0
-0.75	10.0
-0.25	6.0
0.25	1.0
0.75	5.0
1.25	10.0
1.75	7.0
2.25	7.0
2.75	5.0
3.25	1.0

NEGATIVE VALUES MEAN = -1.40
POSITIVE VALUES MEAN = 1.50
NEGATIVE VARIANCE = 0.43
POSITIVE VARIANCE = 0.49
NEGATIVE STANDARD DEVIATION = 0.65
POSITIVE STANDARD DEVIATION = 0.70



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=2.00E+00 UNITS INCH.
VARIATIØNS RUN11ARØLL05 PITCH15
CØURSE 334 E&M DIR. 150 DIST 6.67

VARIATIONS RUN11AROLL05 PITCH15
COURSE 334 E&M DIR. 150 DIST 6.67

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
3.00	0.986
2.50	0.903
2.00	0.764
1.50	0.583
1.00	0.306
0.50	0.097

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	118 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	000 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
.0	.9	28.870
.0	1.7	28.875
.0	2.5	28.884
.0	3.2	28.895
.0	3.8	28.906
.0	4.3	28.917
.0	4.7	28.926
.0	4.9	28.931
.0	5.0	28.933
.0	4.9	28.931
.0	4.7	28.926
.0	4.3	28.917
.0	3.8	28.906
.0	3.2	28.895
.0	2.5	28.884
.0	1.7	28.875
.0	.9	28.870
.0	-.9	28.870
.0	-1.7	28.875
.0	-2.5	28.884
.0	-3.2	28.895
.0	-3.8	28.906
.0	-4.3	28.917
.0	-4.7	28.926
.0	-4.9	28.931
.0	-5.0	28.933
.0	-4.9	28.931
.0	-4.7	28.926
.0	-4.3	28.917
.0	-3.8	28.906
.0	-3.2	28.895
.0	-2.5	28.884
.0	-1.7	28.875
.0	-.9	28.870

AVERAGE VALUE =-28.90 DB

DISTRIBUTION RUN12 ROLL00 PITCH05
COURSE 270 E&M DIR. 152 DIST 7.47

DATA POINTS

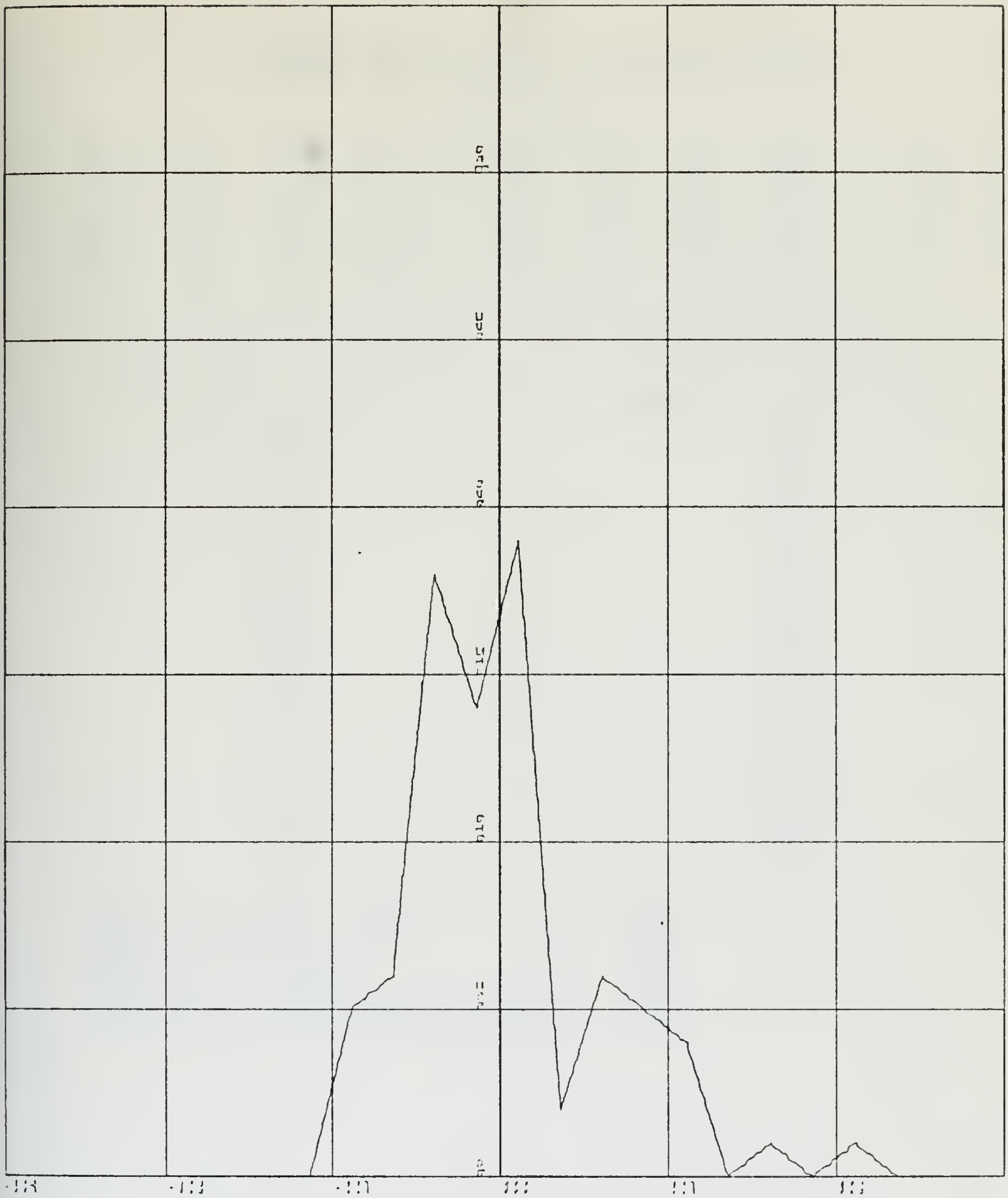
76.0	78.5	76.0	78.0	76.5	78.5	75.5	79.0	75.5
80.0	76.5	78.5	77.0	79.0	76.0	78.0	77.0	79.0
76.0	81.0	76.5	78.0	76.5	78.0	76.5	77.0	76.5
77.0	76.5	77.0	76.5	78.0	75.0	77.0	76.0	77.0
76.0	77.5	76.5	78.0	76.0	79.0	77.0	77.5	76.0
78.5	76.5	77.0	76.5	77.0	76.0	76.5	76.0	77.0
75.5	77.0	76.0	78.5	76.0	77.0	76.0	77.0	76.0
76.5	76.0	77.0	75.0	77.0	75.0	76.0	75.5	76.0
75.5	77.0	75.0	77.0	75.5	77.0	75.0	76.5	76.0

AVERAGE POWER = 76.8DB STANDARD DEVIATION = 1.4

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-5.25	0.0
-4.75	0.0
-4.25	0.0
-3.75	0.0
-3.25	0.0
-2.75	0.0
-2.25	0.0
-1.75	5.0
-1.25	6.0
-0.75	18.0
-0.25	14.0
0.25	19.0
0.75	2.0
1.25	6.0
1.75	5.0
2.25	4.0
2.75	0.0
3.25	1.0
3.75	0.0
4.25	1.0
4.75	0.0
5.25	0.0

NEGATIVE VALUES MEAN = -0.84
POSITIVE VALUES MEAN = 0.96
NEGATIVE VARIANCE = 0.24
POSITIVE VARIANCE = 0.97
NEGATIVE STANDARD DEVIATION = 0.49
POSITIVE STANDARD DEVIATION = 0.98



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
DISTRIBUTION RUN12 ROLL00 PITCH05
COURSE 270 E&M DIR. 152 DIST 7.47

VARIATIONS RUN12 ROLL00 PITCH05
COURSE 270 E&M DIR. 152 DIST 7.47

VARIATIONS

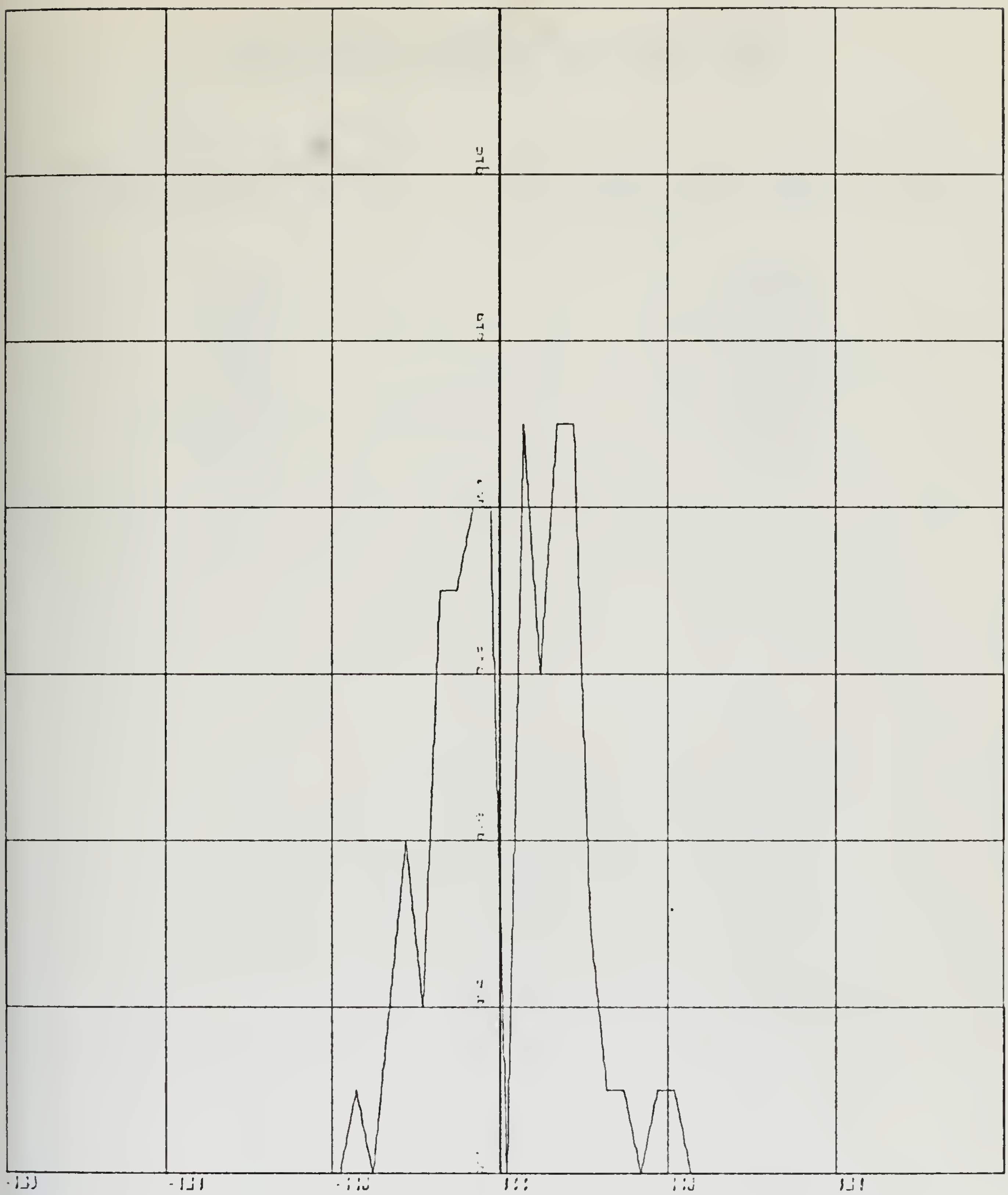
2.5	-2.5	2.0	-1.5	2.0	-3.0	3.5	-3.5	4.5	-3.5
2.0	-1.5	2.0	-3.0	2.0	-1.0	2.0	-3.0	5.0	-4.5
1.5	-1.5	1.5	-1.5	0.5	-0.5	0.5	-0.5	0.5	-0.5
1.5	-3.0	2.0	-1.0	1.0	-1.0	1.5	-1.0	1.5	-2.0
3.0	-2.0	0.5	-1.5	2.5	-2.0	0.5	-0.5	0.5	-1.0
0.5	-0.5	1.0	-1.5	1.5	-1.0	2.5	-2.5	1.0	-1.0
1.0	-1.0	0.5	-0.5	1.0	-2.0	2.0	-2.0	1.0	-0.5
0.5	-0.5	1.5	-2.0	2.0	-1.5	1.5	-2.0	1.5	

AVE. VARIATION = 0.0DB STANDARD DEVIATION = 3.8

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-5.25	0.0
-4.75	0.0
-4.25	1.0
-3.75	0.0
-3.25	2.0
-2.75	4.0
-2.25	2.0
-1.75	7.0
-1.25	7.0
-0.75	8.0
-0.25	8.0
0.25	0.0
0.75	9.0
1.25	6.0
1.75	9.0
2.25	9.0
2.75	3.0
3.25	1.0
3.75	1.0
4.25	0.0
4.75	1.0
5.25	1.0

NEGATIVE VALUES MEAN = -1.67
POSITIVE VALUES MEAN = 1.64
NEGATIVE VARIANCE = 1.02
POSITIVE VARIANCE = 1.09
NEGATIVE STANDARD DEVIATION = 1.01
POSITIVE STANDARD DEVIATION = 1.04



K-SCALE=5.00E+00 UNITS INCH.
Y-SCALE=2.00E+00 UNITS INCH.
VARIATIONS RUN12 ROLL00 PITCH05
COURSE 270 E&M DIR. 152 DIST 7.47

VARIATIONS RUN12 ROLL00 PITCH05
COURSE 270 E&M DIR. 152 DIST 7.47

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
5.00	0.987
4.50	0.975
4.00	0.962
3.50	0.949
3.00	0.911
2.50	0.823
2.00	0.684
1.50	0.481
1.00	0.316
0.50	0.101

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	208 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	026 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
1.2	.9	2.800
2.4	1.7	1.404
3.5	2.5	3.285
4.5	3.2	2.548
5.4	3.8	1.852
6.1	4.3	2.269
6.6	4.7	2.743
6.9	4.9	2.880
7.0	5.0	2.884
6.9	4.9	2.880
6.6	4.7	2.743
6.1	4.3	2.269
5.4	3.8	1.852
4.5	3.2	2.548
3.5	2.5	3.285
2.4	1.7	1.404
1.2	.9	2.800
-1.2	-.9	3.005
-2.4	-1.7	1.349
-3.5	-2.5	3.127
-4.5	-3.2	2.783
-5.4	-3.8	1.912
-6.1	-4.3	2.094
-6.6	-4.7	2.551
-6.9	-4.9	2.784
-7.0	-5.0	2.834
-6.9	-4.9	2.784
-6.6	-4.7	2.551
-6.1	-4.3	2.094
-5.4	-3.8	1.912
-4.5	-3.2	2.783
-3.5	-2.5	3.127
-2.4	-1.7	1.349
-1.2	-.9	3.005

AVERAGE VALUE = 2.48 DB

DISTRIBUTION RUN13 ROLL07 PITCH05
COURSE 000 E&M DIR. 152 DIST 7.47

DATA POINTS

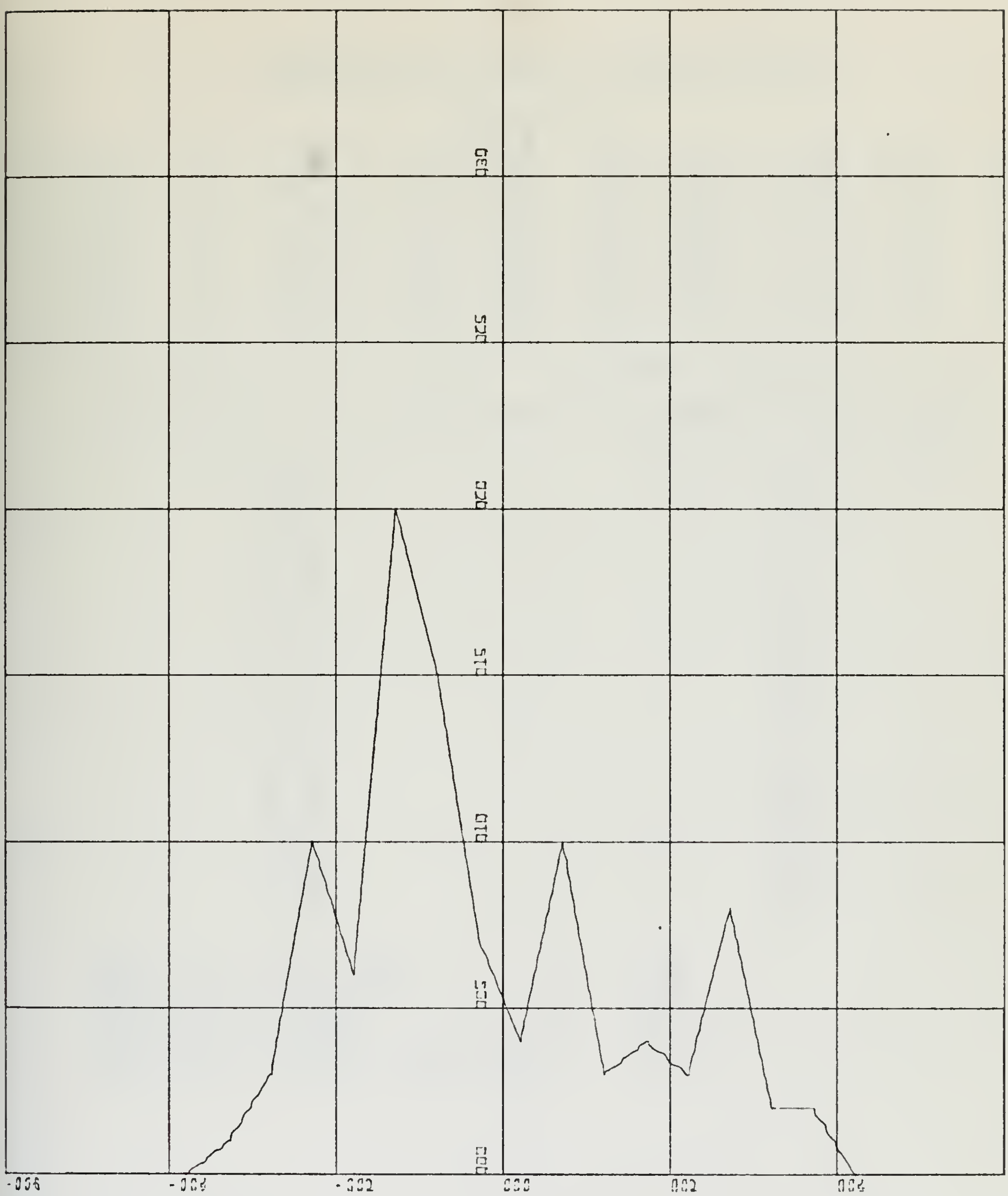
77.0	76.0	77.0	75.5	77.0	75.5	77.0	76.0	77.0
76.0	77.5	76.0	77.0	76.5	77.0	76.5	77.0	75.5
77.5	75.0	78.0	76.0	77.0	76.0	77.0	76.0	77.5
77.0	79.0	76.5	78.5	77.0	78.0	77.0	77.5	76.5
79.0	76.0	78.0	76.5	79.0	76.0	81.0	77.5	79.0
77.5	79.0	77.0	78.5	77.0	78.0	76.0	79.5	77.0
79.5	77.0	79.0	77.0	80.0	77.5	80.5	77.5	80.5
77.5	80.0	79.0	81.5	78.0	79.5	79.0	81.0	78.5
81.0	79.0	80.5	77.5	80.0	77.5	81.5	77.0	79.0
77.5	81.0	76.5	81.0	78.0	81.0	78.0	81.0	78.5
81.0	77.0	80.0	77.5	82.0	77.5	82.0	77.5	

AVERAGE POWER = 78.0DB STANDARD DEVIATION = 2.9

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-4.25	0.0
-3.75	0.0
-3.25	1.0
-2.75	3.0
-2.25	10.0
-1.75	6.0
-1.25	20.0
-0.75	15.0
-0.25	7.0
0.25	4.0
0.75	10.0
1.25	3.0
1.75	4.0
2.25	3.0
2.75	8.0
3.25	2.0
3.75	2.0
4.25	0.0

NEGATIVE VALUES MEAN = -1.12
POSITIVE VALUES MEAN = 1.93
NEGATIVE VARIANCE = 0.53
POSITIVE VARIANCE = 1.17
NEGATIVE STANDARD DEVIATION = 0.73
POSITIVE STANDARD DEVIATION = 1.08



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
DISTRIBUTION RUN13 ROLL07 PITCH05
COURSE 000 E&M DIR. 152 DIST 7.47

VARIATIONS RUN13 ROLL07 PITCH05
COURSE 000 E&M DIR. 152 DIST 7.47

VARIATIONS

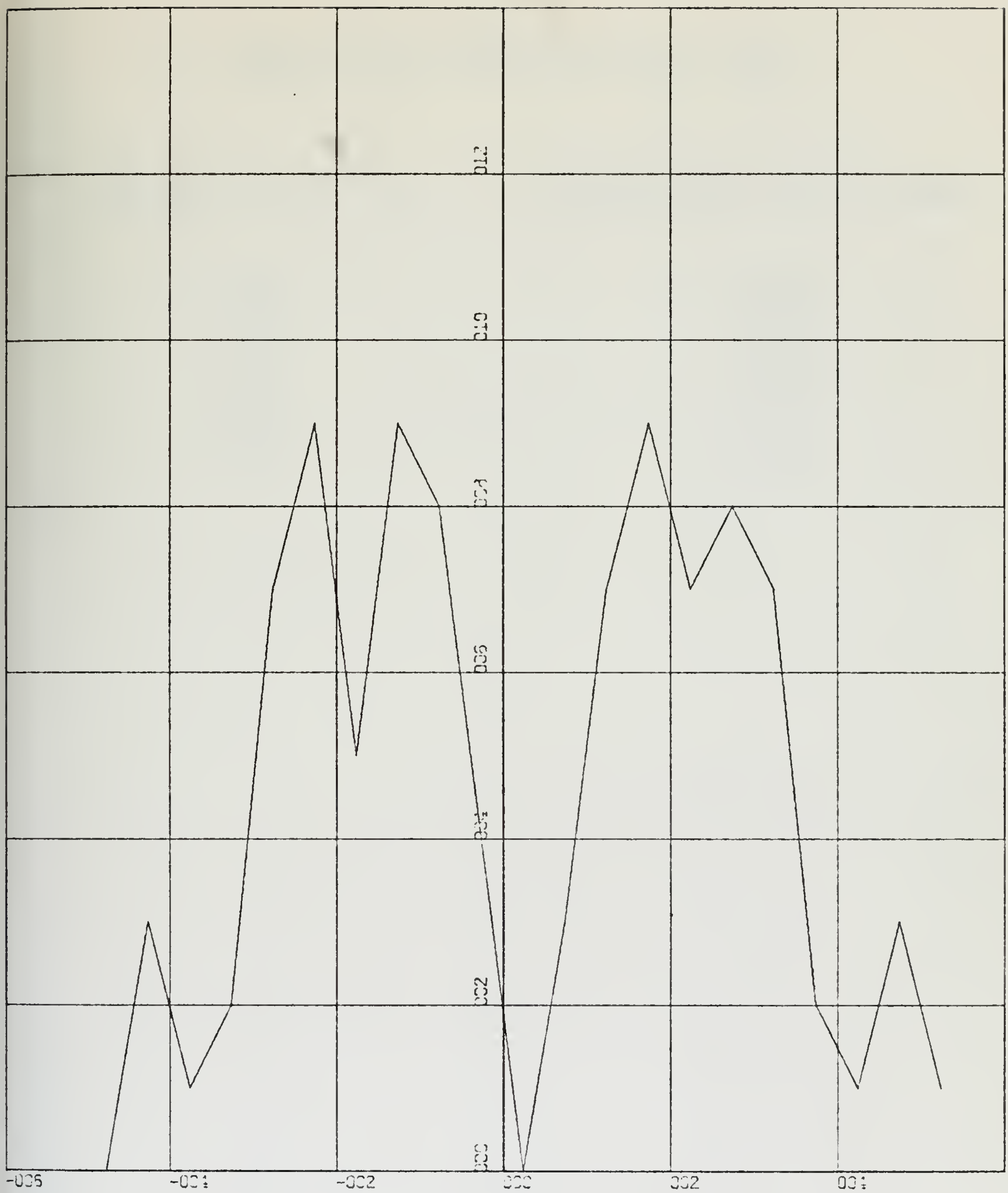
-1.0	1.0	-1.5	1.5	-1.5	1.5	-1.0	1.0	-1.0	1.5
-1.5	1.0	-0.5	0.5	-0.5	0.5	-1.5	2.0	-2.5	3.0
-2.0	1.0	-1.0	1.0	-1.0	1.5	-0.5	2.0	-2.5	2.0
-1.5	1.0	-1.0	0.5	-1.0	2.5	-3.0	2.0	-1.5	2.5
-3.0	5.0	-3.5	1.5	-1.5	1.5	-2.0	1.5	-1.5	1.0
-2.0	3.5	-2.5	2.5	-2.5	2.0	-2.0	3.0	-2.5	3.0
-3.0	3.0	-3.0	2.5	-1.0	2.5	-3.5	1.5	-0.5	2.0
-2.5	2.5	-2.0	1.5	-3.0	2.5	-2.5	4.0	-4.5	2.0
-1.5	3.5	-4.5	4.5	-3.0	3.0	-3.0	3.0	-2.5	2.5
-4.0	3.0	-2.5	4.5	-4.5	4.5				

AVE. VARIATION = 0.1DB STANDARD DEVIATION = 5.9

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-5.25	0.0
-4.75	0.0
-4.25	3.0
-3.75	1.0
-3.25	2.0
-2.75	7.0
-2.25	9.0
-1.75	5.0
-1.25	9.0
-0.75	8.0
-0.25	4.0
0.25	0.0
0.75	3.0
1.25	7.0
1.75	9.0
2.25	7.0
2.75	8.0
3.25	7.0
3.75	2.0
4.25	1.0
4.75	3.0
5.25	1.0

NEGATIVE VALUES MEAN = -2.11
POSITIVE VALUES MEAN = 2.22
NEGATIVE VARIANCE = 1.17
POSITIVE VARIANCE = 1.25
NEGATIVE STANDARD DEVIATION = 1.08
POSITIVE STANDARD DEVIATION = 1.12



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=2.00E+00 UNITS INCH.
VARIATIØNS RUN13 RØLL07 PITCH05
CØURSE 000 E&M DIR. 152 DIST 7.47

VARIATIONS RUN13 ROLL07 PITCH05
COURSE 000 E&M DIR. 152 DIST 7.47

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
5.00	0.990
4.50	0.958
4.00	0.917
3.50	0.885
3.00	0.792
2.50	0.635
2.00	0.469
1.50	0.323
1.00	0.156
0.50	0.042

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	121 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	4
DIRECTION OF SEA	=	000 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
.0	1.7	28.876
.0	3.4	28.899
.0	5.0	28.934
.0	6.4	28.977
.0	7.7	29.024
.0	8.7	29.067
.0	9.4	29.103
.0	9.9	29.126
.0	10.0	29.134
.0	9.9	29.126
.0	9.4	29.103
.0	8.7	29.067
.0	7.7	29.024
.0	6.4	28.977
.0	5.0	28.934
.0	3.4	28.899
.0	1.7	28.876
.0	-1.7	28.876
.0	-3.4	28.899
.0	-5.0	28.934
.0	-6.4	28.977
.0	-7.7	29.024
.0	-8.7	29.067
.0	-9.4	29.103
.0	-9.9	29.126
.0	-10.0	29.134
.0	-9.9	29.126
.0	-9.4	29.103
.0	-8.7	29.067
.0	-7.7	29.024
.0	-6.4	28.977
.0	-5.0	28.934
.0	-3.4	28.899
.0	-1.7	28.876

AVERAGE VALUE =-29.01 DB

DISTRIBUTION RUN19 ROLL00 PITCH10
COURSE 270 E&M DIR. 149 DIST 10.49

DATA POINTS

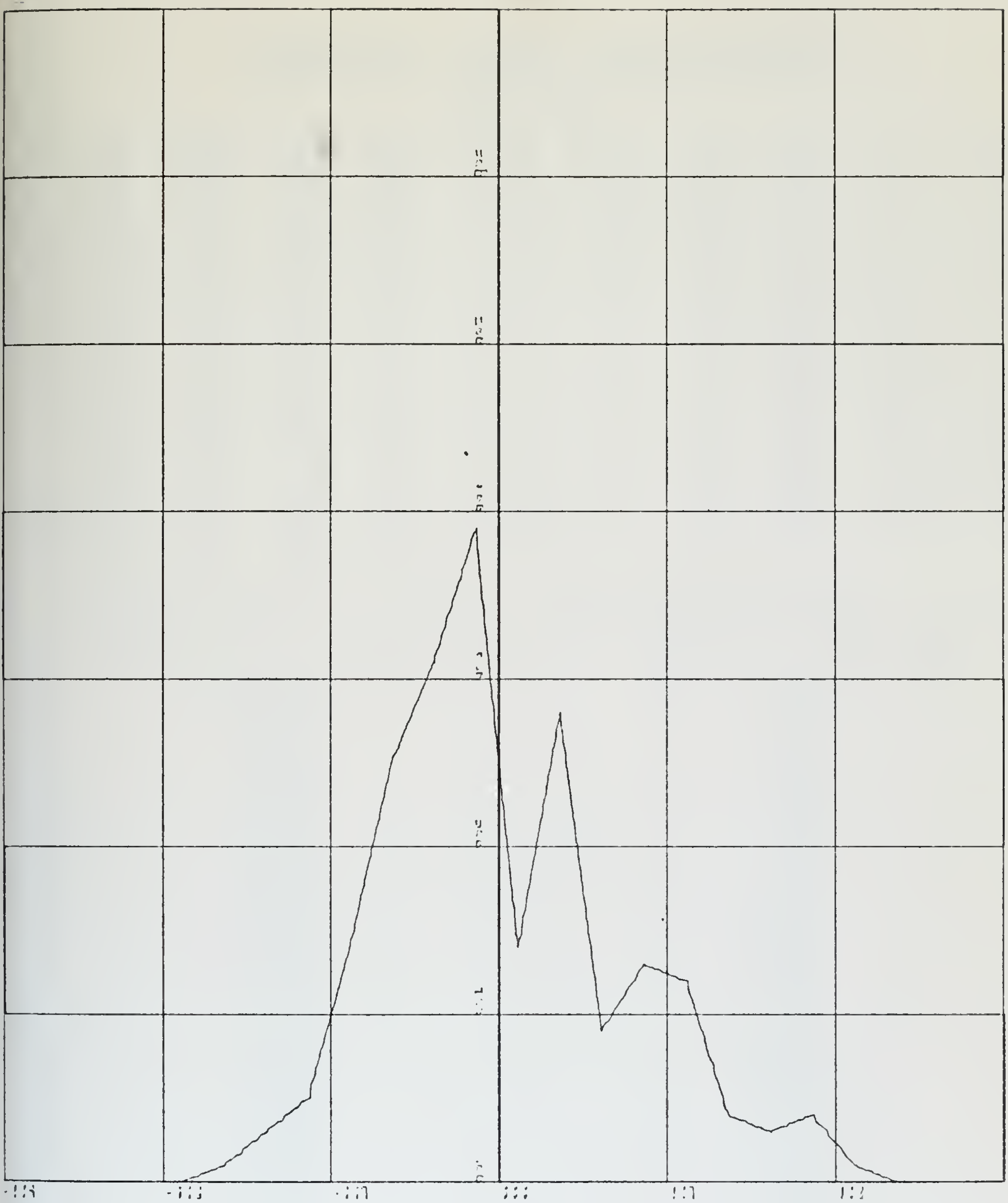
81.5	83.0	82.0	83.0	82.0	83.0	82.5	84.0	81.0
82.5	81.5	84.0	83.0	83.5	81.5	84.0	81.5	83.0
82.5	84.5	82.5	84.0	83.0	85.0	80.5	83.0	82.5
83.0	82.0	83.5	82.5	83.0	81.0	83.5	83.0	83.5
83.0	84.5	82.0	83.0	81.5	86.0	82.5	83.0	82.0
82.5	81.0	84.0	82.5	85.5	83.0	84.5	83.0	83.5
82.5	83.5	82.0	84.0	82.5	85.0	81.5	83.5	82.5
84.0	82.5	84.0	82.5	83.0	82.5	83.0	82.0	83.0
82.0	83.5	80.5	82.0	81.0	84.0	82.5	85.0	83.0
84.5	81.5	83.0	82.0	86.5	81.0	82.5	81.5	84.0
82.0	85.0	81.5	82.5	81.5	84.0	82.0	84.5	83.0
85.5	84.0	85.0	82.0	84.5	83.0	85.0	84.0	85.5
82.5	85.5	83.0	84.0	82.5	85.0	82.5	85.5	83.0
86.5	82.0	83.5	81.5	84.0	82.0	84.5	83.0	85.5
84.0	85.0	82.0	84.5	83.0	85.0	84.0	85.5	82.5
85.5	83.0	84.0	82.5	85.0	82.5	85.5	83.0	86.5
82.0	83.5	82.5	85.5	82.5	87.0	84.5	87.5	84.0
85.0	83.0	84.0	82.0	84.0	83.0	84.0	83.0	84.0
83.0	84.0	82.0	83.0	82.0	87.0	83.0	85.5	80.5
87.0	82.5	83.0	81.5	83.5	82.5	86.0	82.0	83.0
82.0	83.0	82.0	85.5	84.0	86.0	83.0	84.0	81.5
82.5	81.5	85.0	82.5	84.0	82.5	85.0	83.5	84.0
82.0	83.5	80.0	87.0	83.5	86.0	82.0	83.0	

AVERAGE POWER = 83.3DB STANDARD DEVIATION = 2.1

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-5.25	0.0
-4.75	0.0
-4.25	0.0
-3.75	0.0
-3.25	1.0
-2.75	3.0
-2.25	5.0
-1.75	14.0
-1.25	25.0
-0.75	31.0
-0.25	39.0
0.25	14.0
0.75	28.0
1.25	9.0
1.75	13.0
2.25	12.0
2.75	4.0
3.25	3.0
3.75	4.0
4.25	1.0
4.75	0.0
5.25	0.0

NEGATIVE VALUES MEAN = -1.01
POSITIVE VALUES MEAN = 1.36
NEGATIVE VARIANCE = 0.47
POSITIVE VARIANCE = 1.02
NEGATIVE STANDARD DEVIATION = 0.69
POSITIVE STANDARD DEVIATION = 1.01



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=1.00E+01 UNITS INCH.
DISTRIBUTION RUN19 ROLL00 PITCH10
COURSE 270 E&M DIR. 149 DIST 10.49

VARIATIONS RUN19 ROLL00 PITCH10
COURSE 270 E&M DIR. 149 DIST 10.49

VARIATIONS

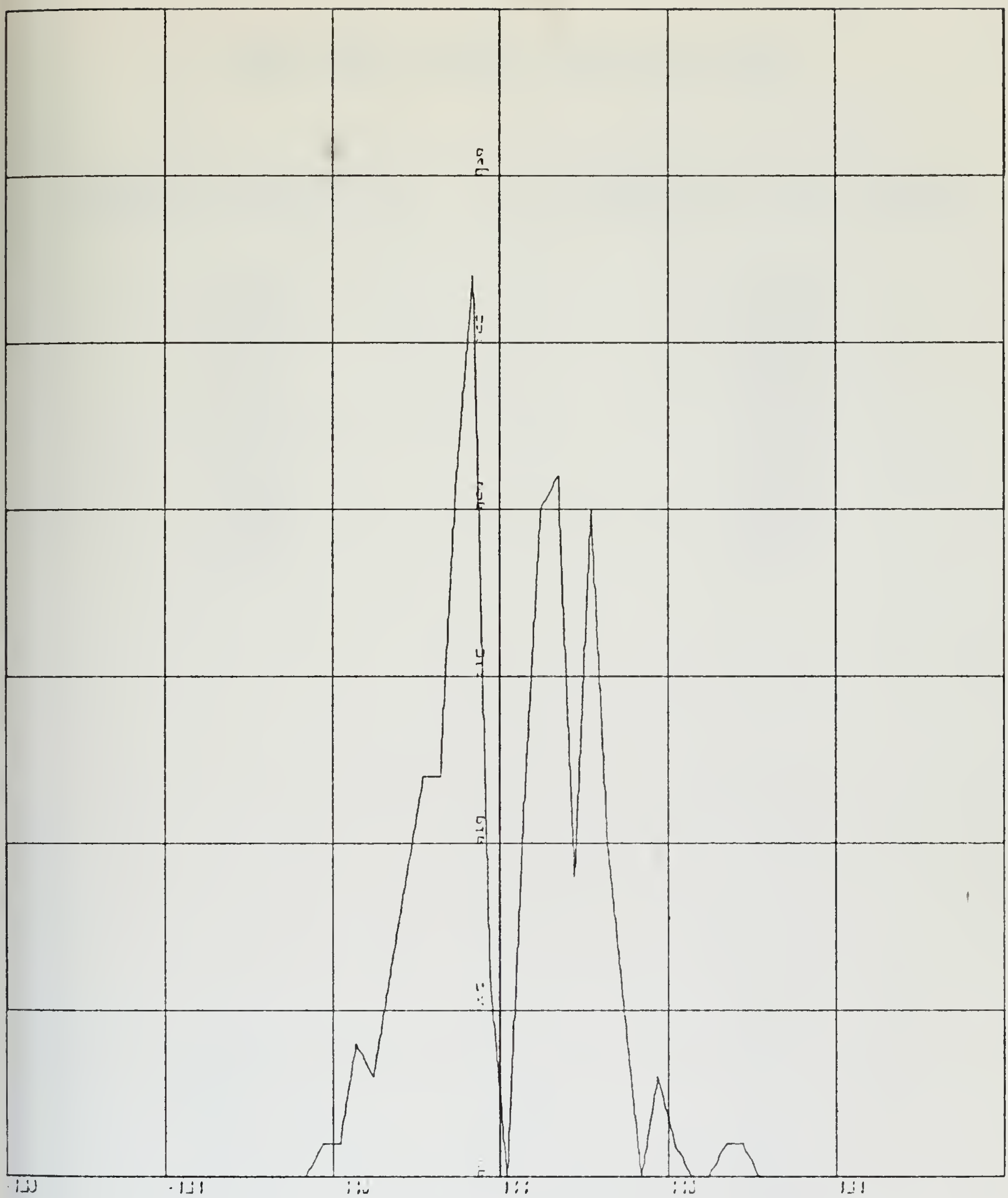
1.5	-1.0	1.0	-1.0	1.0	-0.5	1.5	-3.0	1.5	-1.0
2.5	-1.0	0.5	-2.0	2.5	-2.5	1.5	-0.5	2.0	-2.0
1.5	-1.0	2.0	-4.5	2.5	-0.5	0.5	-1.0	1.5	-1.0
0.5	-2.0	2.5	-0.5	0.5	-0.5	1.5	-2.5	1.0	-1.5
4.5	-3.5	0.5	-1.0	0.5	-1.5	3.0	-1.5	3.0	-2.5
1.5	-1.5	0.5	-1.0	1.0	-1.5	2.0	-1.5	2.5	-3.5
2.0	-1.0	1.5	-1.5	1.5	-1.5	0.5	-0.5	0.5	-1.0
1.0	-1.0	1.5	-3.0	1.5	-1.0	3.0	-1.5	2.5	-2.0
1.5	-3.0	1.5	-1.0	4.5	-5.5	1.5	-1.0	2.5	-2.0
3.0	-3.5	1.0	-1.0	2.5	-2.0	2.5	-1.5	2.5	-1.5
1.0	-3.0	2.5	-1.5	2.0	-1.0	1.5	-3.0	3.0	-2.5
1.0	-1.5	2.5	-2.5	3.0	-2.5	3.5	-4.5	1.5	-2.0
2.5	-2.0	2.5	-1.5	2.5	-1.5	1.0	-3.0	2.5	-1.5
2.0	-1.0	1.5	-3.0	3.0	-2.5	1.0	-1.5	2.5	-2.5
3.0	-2.5	3.5	-4.5	1.5	-1.0	3.0	-3.0	4.5	-2.5
3.0	-3.5	1.0	-2.0	1.0	-2.0	2.0	-1.0	1.0	-1.0
1.0	-1.0	1.0	-2.0	1.0	-1.0	5.0	-4.0	2.5	-5.0
6.5	-4.5	0.5	-1.5	2.0	-1.0	3.5	-4.0	1.0	-1.0
1.0	-1.0	3.5	-1.5	2.0	-3.0	1.0	-2.5	1.0	-1.0
3.5	-2.5	1.5	-1.5	2.5	-1.5	0.5	-2.0	1.5	-3.5
7.0	-3.5	2.5	-4.0						

AVE. VARIATION = 0.0DB STANDARD DEVIATION = 5.4

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-7.25	0.0
-6.75	0.0
-6.25	0.0
-5.75	0.0
-5.25	1.0
-4.75	1.0
-4.25	4.0
-3.75	3.0
-3.25	6.0
-2.75	9.0
-2.25	12.0
-1.75	12.0
-1.25	21.0
-0.75	27.0
-0.25	6.0
0.25	0.0
0.75	11.0
1.25	20.0
1.75	21.0
2.25	9.0
2.75	20.0
3.25	10.0
3.75	5.0
4.25	0.0
4.75	3.0
5.25	1.0
5.75	0.0
6.25	0.0
6.75	1.0
7.25	1.0

NEGATIVE VALUES MEAN = -2.00
POSITIVE VALUES MEAN = 2.00
NEGATIVE VARIANCE = 1.28
POSITIVE VARIANCE = 1.48
NEGATIVE STANDARD DEVIATION = 1.13
POSITIVE STANDARD DEVIATION = 1.22



X-SCALE=5.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
VARIATIONS RUN19 ROLL00 PITCH10
COURSE 270 E&M DIR. 149 DIST 10.49

VARIATIONS   RUN19 ROLL00 PITCH10
COURSE 270 E&M DIR. 149 DIST 10.49

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
7.00	0.995
6.50	0.990
6.00	0.990
5.50	0.990
5.00	0.980
4.50	0.961
4.00	0.941
3.50	0.902
3.00	0.824
2.50	0.681
2.00	0.578
1.50	0.417
1.00	0.216
0.50	0.029

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	211 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	1
DIRECTION OF SEA	=	049 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
1.0	.0	3.638
2.1	.0	1.192
3.0	.0	2.514
3.9	.0	3.337
4.6	.0	2.384
5.2	.0	1.878
5.7	.0	1.967
5.9	.0	2.179
6.0	.0	2.267
5.9	.0	2.179
5.7	.0	1.967
5.2	.0	1.878
4.6	.0	2.384
3.9	.0	3.337
3.0	.0	2.514
2.1	.0	1.192
1.0	.0	3.638
-1.0	.0	3.850
-2.1	.0	1.237
-3.0	.0	2.302
-3.9	.0	3.359
-4.6	.0	2.622
-5.2	.0	1.987
-5.7	.0	1.912
-5.9	.0	2.035
-6.0	.0	2.099
-5.9	.0	2.035
-5.7	.0	1.912
-5.2	.0	1.987
-4.6	.0	2.622
-3.9	.0	3.359
-3.0	.0	2.302
-2.1	.0	1.237
-1.0	.0	3.850

AVERAGE VALUE = 2.39 DB

DISTRIBUTION RUN 20 ROLL06 PITCH00
COURSE 000 E&M DIR. 149 DIST 10.49

DATA POINTS

82.0	86.0	85.0	85.5	84.5	85.5	85.0	85.5	81.0
88.0	87.0	88.5	87.5	89.0	88.0	89.0	88.0	89.5
88.0	89.0	88.0	88.5	82.5	86.0	85.5	86.0	85.5
86.5	85.5	86.5	85.5	86.0	85.0	86.5	85.5	86.0
85.5	86.5	85.0	86.5	85.5	86.5	85.0	85.5	84.5
85.0	84.5	85.0	84.5	86.0	85.0	85.5	85.0	85.5
85.0	85.5	85.0	85.5	85.0	86.0	85.5	86.5	84.5
85.0	84.5	85.0	84.5	87.0	86.5	87.5	85.5	86.5
85.5	86.0	84.5	85.0	84.0	85.0	84.0	85.5	84.5
85.5	84.5	85.5	85.0	85.5	85.0	86.0	85.5	88.0
87.5	89.0	88.0	89.0	88.0	88.5	84.5	85.5	85.0
88.0	87.5	88.0	87.5	88.5	87.5	88.5	87.5	88.0
84.5	85.0	84.0	84.5	84.0	85.0	84.5	86.5	86.0
87.0	86.5	88.0	87.0	88.0	86.5	88.0	86.5	87.5
86.5	87.5	86.0	87.0	86.0	86.5	85.5	86.0	85.0
86.0	85.5	86.0	85.0	86.0	85.0	85.5	84.5	85.5
85.0	85.5	85.0	88.0	87.5	88.5	85.5	88.0	85.0
86.0	85.5	86.5	86.0	86.5	85.5	88.0	87.5	88.5
87.0	88.0	86.5	87.0	86.0	86.5	85.5	86.0	85.5
86.0	85.5	86.5	85.5	87.0	85.5	86.5	85.5	86.5
85.5	86.5	85.5	86.5	85.5	86.5	85.5	87.0	85.5
87.0	85.0	85.5	84.0	85.0	84.5	85.5	85.0	85.5
85.0	86.0	85.0	86.5	85.5	87.0	86.5	87.0	86.5
87.0	85.5	86.5	85.0	85.5	84.5	85.5	85.0	87.0
86.5	87.5	86.0	88.0	87.0	88.0	87.0	88.0	87.0
88.0	86.5	87.5	84.0	85.0	84.0	85.5	84.5	85.5
84.5	86.0	85.5	87.5	87.0	88.0	87.5	88.0	86.5
87.0	86.0	87.0	85.5	86.0	84.5	85.5	84.5	87.5
86.5	87.5	86.5	87.5	86.5	87.0	86.0	86.5	86.0
86.5	85.5	86.5	85.5	86.0	85.5	86.0	85.5	86.0
85.5	87.0	86.5	87.0	85.5	86.0	85.0	85.5	84.5
85.0	84.0	85.0	84.0	85.0	84.5	85.5	85.0	85.5
85.0	85.5	85.0	85.5	85.0	87.0	86.5	88.0	87.0
88.0	86.5	88.0	86.5	88.0	86.5	87.0	85.5	86.0
85.5	86.0	85.0	86.0	84.5	85.5	84.5	85.0	84.5
86.0	85.0	86.5	85.5	87.0	86.5	87.0	86.5	87.0
85.0	85.5	85.0	85.5	85.0	85.5	84.5	85.0	84.5
85.0	84.5	85.0	84.5	85.5	85.0	86.5	86.0	87.0
86.5	88.0	87.5	88.5	88.0	89.0	88.5	90.0	89.0
89.5	88.0	88.5	84.0	85.0	84.5	85.0	83.5	84.0
83.0	83.5	83.0	85.5	85.0	85.5	85.0	86.0	85.5
86.0	85.5	86.5	85.5	86.0	85.5	87.0	85.5	86.0
85.5	86.5	85.0	85.5	84.0	85.5	84.5	85.5	85.0
86.0	85.5	86.5	86.0	87.0	86.5	87.5	87.0	88.0
87.0	88.0	87.5	88.0	87.5	88.5	87.0	87.5	86.0
86.5	86.0	86.5	85.5	86.0	86.0	86.5	86.0	86.5
86.0	86.5	86.0	86.5	85.5	86.5	86.0	87.0	86.5
88.0	87.0	88.0	87.5	88.5	87.0	88.0	86.5	87.5
86.0	86.5	85.5	86.0	85.5	86.0	84.5	85.0	83.5
84.0	83.0	84.0	83.0	84.0	83.5	85.0	84.5	85.0
85.0	86.0	85.0	86.5	86.0	87.0	86.5	88.0	85.5
86.0	85.0	85.5	85.0	85.5	84.0	84.5	84.0	84.5
84.0	85.5	85.0	86.0	85.5	86.0	85.0	85.5	85.5
86.0	85.0	85.5	84.5	85.0	84.5	85.5	85.0	85.5
85.0	85.5	85.0	86.0	85.5	86.0	85.5	87.0	86.5
87.0	86.5	87.0	86.0	86.5	85.5	86.0	84.5	85.0
84.5	85.0	84.5	85.5	84.5	85.5	85.0	85.5	85.0
85.5	85.0	85.5	85.0	85.5	85.0	85.5	85.0	86.0
85.5	86.5	86.0	86.5	85.5	86.0	85.5	86.0	85.5
86.0	85.5	86.5	85.5	86.5	85.5	86.0	86.0	86.5
86.0	86.5	85.5	86.0	85.0	85.5	84.0	84.5	84.0
85.5	85.0	85.5	85.0	85.5	86.5	87.0	85.0	85.5
85.0	86.5	86.0	87.5	87.0	88.0	87.5	88.5	84.5
85.0	84.0	84.5	83.5	84.0	83.5	84.0	83.5	84.0
84.0	85.0	84.5	85.0	84.5	85.0	84.5	85.5	85.5

DISTRIBUTION RUN 20 ROLL06 PITCH00
COURSE 000 E&M DIR. 149 DIST 10.49

DATA POINTS

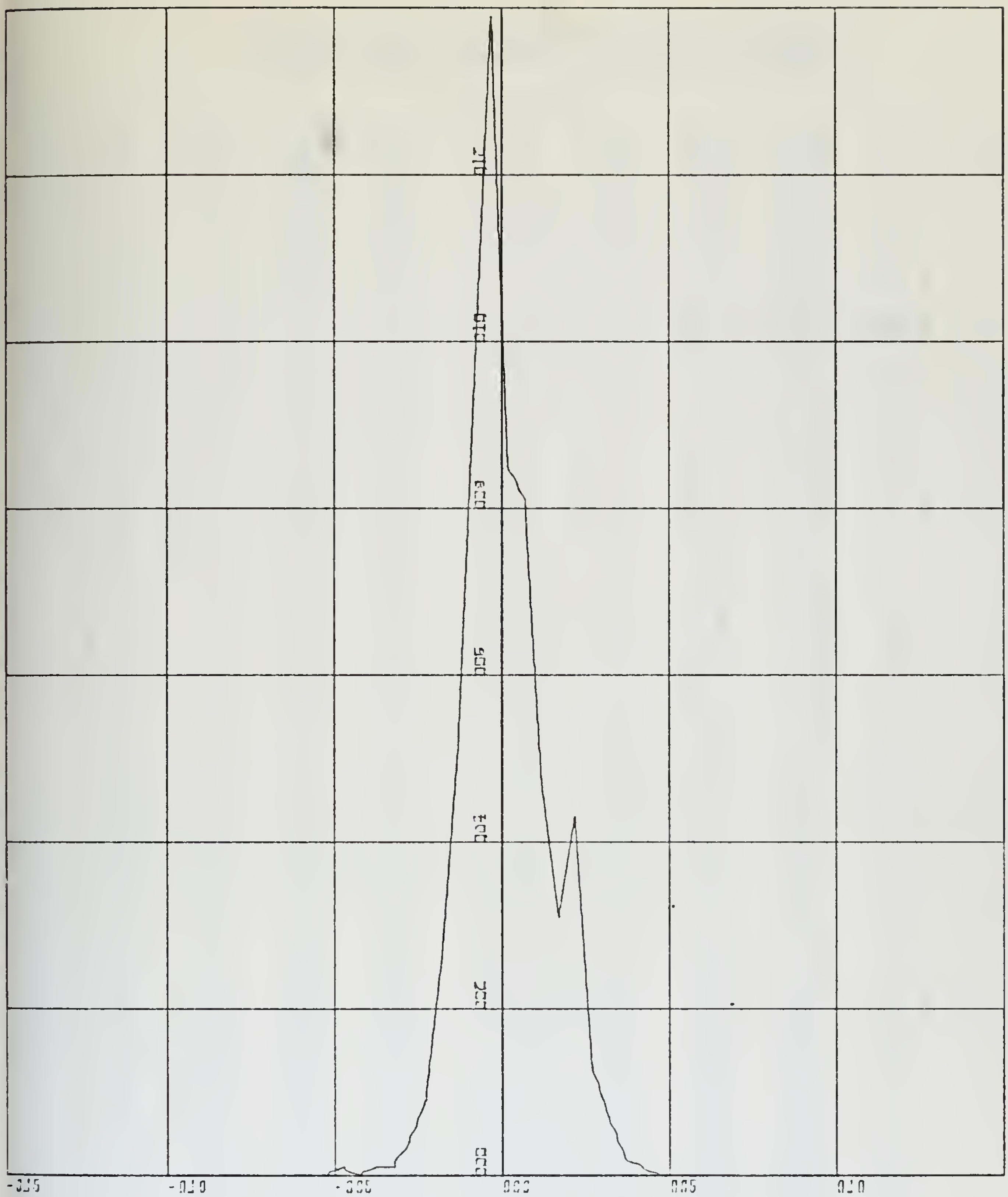
85.0	86.0	85.5	86.0	85.5	86.0	85.5	86.0	85.5
86.0	85.5	86.5	85.5	86.0	85.5	86.0	85.5	86.5
85.5	86.5	85.5	86.5	85.5	87.0	86.0	87.0	86.0
86.5	85.5	86.0	85.0	85.5	84.5	85.0	84.5	85.0
83.5	84.5	83.5	85.0	84.0	86.5	86.0	87.5	87.0
88.0	87.5	88.0	87.5	88.0	87.5	88.0		

AVERAGE POWER = 85.9DB STANDARD DEVIATION = 1.5

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-5.25	0.0
-4.75	1.0
-4.25	0.0
-3.75	1.0
-3.25	1.0
-2.75	4.0
-2.25	9.0
-1.75	26.0
-1.25	51.0
-0.75	95.0
-0.25	139.0
0.25	85.0
0.75	81.0
1.25	47.0
1.75	31.0
2.25	43.0
2.75	13.0
3.25	7.0
3.75	2.0
4.25	1.0
4.75	0.0
5.25	0.0

NEGATIVE VALUES MEAN = -0.95
POSITIVE VALUES MEAN = 1.01
NEGATIVE VARIANCE = 0.43
POSITIVE VARIANCE = 0.75
NEGATIVE STANDARD DEVIATION = 0.66
POSITIVE STANDARD DEVIATION = 0.87



K-SCALE=5.00E+00 UNITS INCH.
Y-SCALE=2.00E+01 UNITS INCH.
DISTRIBUTION RUN 20 ROLL06 PITCH00
COURSE 000 E&M DIR. 149 DIST 10.49

VARIATIONS RUN 20 ROLL06 PITCH00
COURSE 000 E&M DIR. 149 DIST 10.49

VARIATIONS

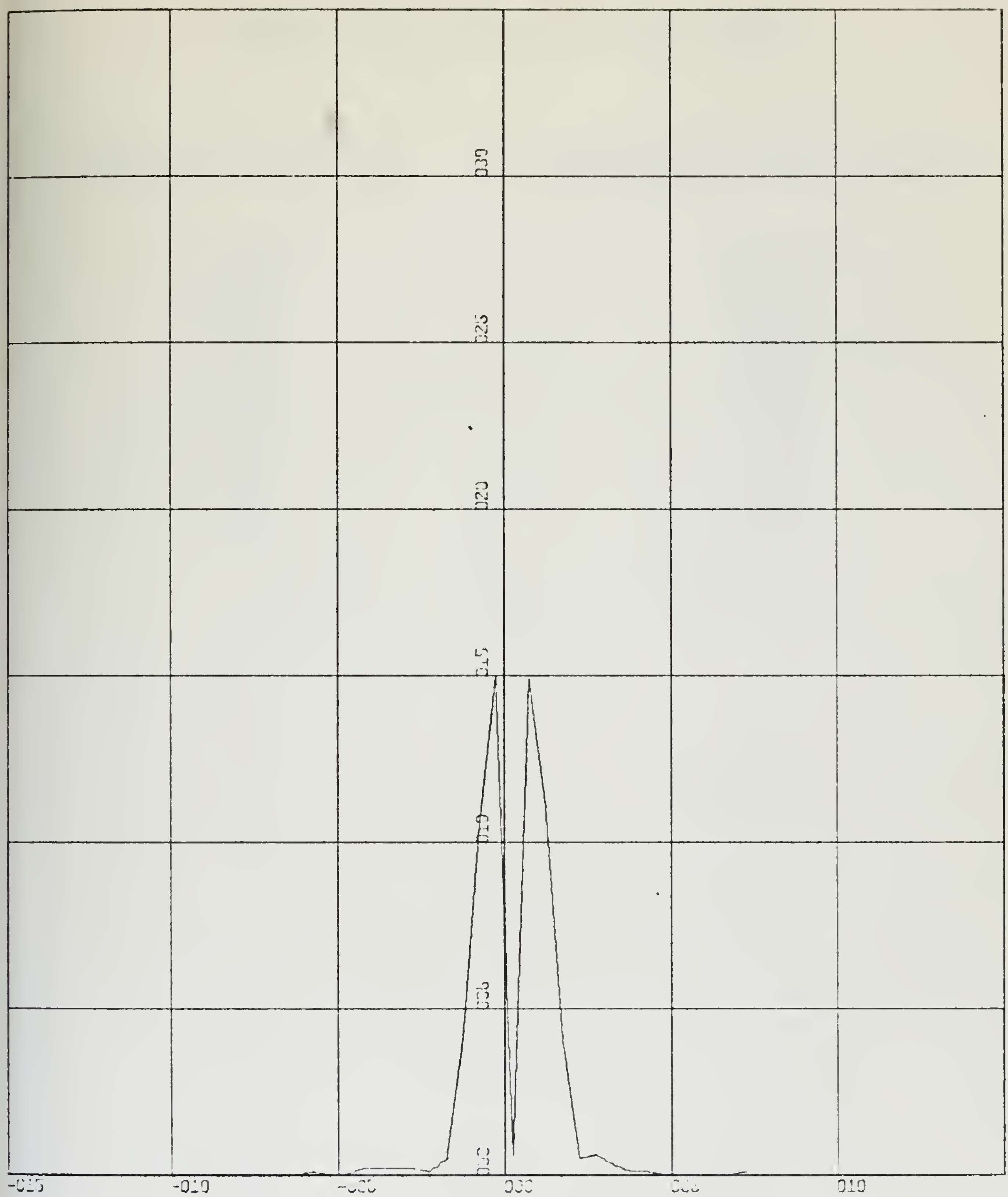
4.0	-1.0	0.5	-1.0	1.0	-0.5	0.5	-4.5	7.0	-1.0
1.5	-1.0	1.5	-1.0	1.0	-1.0	1.5	-1.5	1.0	-1.0
0.5	-6.0	3.5	-0.5	0.5	-0.5	1.0	-1.0	1.0	-1.0
0.5	-1.0	1.5	-1.0	0.5	-0.5	1.0	-1.5	1.5	-1.0
1.0	-1.5	0.5	-1.0	0.5	-0.5	0.5	-0.5	1.5	-1.0
0.5	-0.5	0.5	-0.5	0.5	-0.5	0.5	-0.5	1.0	-0.5
1.0	-2.0	0.5	-0.5	0.5	-0.5	2.5	-0.5	1.0	-2.0
1.0	-1.0	0.5	-1.5	0.5	-1.0	1.0	-1.0	1.5	-1.0
1.0	-1.0	1.0	-0.5	0.5	-0.5	1.0	-0.5	2.5	-0.5
1.5	-1.0	1.0	-1.0	0.5	-4.0	1.0	-0.5	3.0	-0.5
0.5	-0.5	1.0	-1.0	1.0	-1.0	0.5	-3.5	0.5	-1.0
0.5	-0.5	1.0	-0.5	2.0	-0.5	1.0	-0.5	1.5	-1.0
1.0	-1.5	1.5	-1.5	1.0	-1.0	1.0	-1.5	1.0	-1.0
0.5	-1.0	0.5	-1.0	1.0	-0.5	0.5	-1.0	1.0	-1.0
0.5	-1.0	1.0	-0.5	0.5	-0.5	3.0	-0.5	1.0	-3.0
2.5	-3.0	1.0	-0.5	1.0	-0.5	0.5	-1.0	2.5	-0.5
1.0	-1.5	1.0	-1.5	0.5	-1.0	0.5	-1.0	0.5	-0.5
0.5	-0.5	1.0	-1.0	1.5	-1.5	1.0	-1.0	1.0	-1.0
1.0	-1.0	1.0	-1.0	1.0	-1.0	1.5	-1.5	1.5	-2.0
0.5	-1.5	1.0	-0.5	1.0	-0.5	0.5	-0.5	1.0	-1.0
1.5	-1.0	1.5	-0.5	0.5	-0.5	0.5	-1.5	1.0	-1.5
0.5	-1.0	1.0	-0.5	2.0	-0.5	1.0	-1.5	2.0	-1.0
1.0	-1.0	1.0	-1.0	1.0	-1.5	1.0	-3.5	1.0	-1.0
1.5	-1.0	1.0	-1.0	1.5	-0.5	2.0	-0.5	1.0	-0.5
0.5	-1.5	0.5	-1.0	1.0	-1.5	0.5	-1.5	1.0	-1.0
3.0	-1.0	1.0	-1.0	1.0	-1.0	0.5	-1.0	0.5	-0.5
0.5	-1.0	1.0	-1.0	0.5	-0.5	0.5	-0.5	0.5	-0.5
1.5	-0.5	0.5	-1.5	0.5	-1.0	0.5	-1.0	0.5	-1.0
1.0	-1.0	1.0	-0.5	1.0	-0.5	0.5	-0.5	0.5	-0.5
0.5	-0.5	2.0	-0.5	1.5	-1.0	1.0	-1.5	1.5	-1.5
1.5	-1.5	0.5	-1.5	0.5	-0.5	0.5	-1.0	1.0	-1.5
1.0	-1.0	0.5	-0.5	1.5	-1.0	1.5	-1.0	1.5	-0.5
0.5	-0.5	0.5	-2.0	0.5	-0.5	0.5	-0.5	0.5	-1.0
0.5	-0.5	0.5	-0.5	0.5	-0.5	1.0	-0.5	1.5	-0.5
1.0	-0.5	1.5	-0.5	1.0	-0.5	1.0	-0.5	1.5	-1.0
0.5	-1.5	0.5	-4.5	1.0	-0.5	0.5	-1.5	0.5	-1.0
0.5	-0.5	2.5	-0.5	0.5	-0.5	1.0	-0.5	0.5	-0.5
1.0	-1.0	0.5	-0.5	1.5	-1.5	0.5	-0.5	1.0	-1.5
0.5	-1.5	1.5	-1.0	1.0	-0.5	1.0	-0.5	1.0	-0.5
1.0	-0.5	1.0	-0.5	1.0	-1.0	1.0	-0.5	0.5	-0.5
1.0	-1.5	0.5	-1.5	0.5	-0.5	0.5	-1.0	0.5	0.0
0.5	-0.5	0.5	-0.5	0.5	-0.5	0.5	-1.0	1.0	-0.5
1.0	-0.5	1.5	-1.0	1.0	-0.5	1.0	-1.5	1.0	-1.5
1.0	-1.5	0.5	-1.0	0.5	-0.5	0.5	-1.5	0.5	-1.5
0.5	-1.0	1.0	-1.0	1.0	-0.5	1.5	-0.5	0.5	0.0
1.0	-1.0	1.5	-0.5	1.0	-0.5	1.5	-2.5	0.5	-1.0
0.5	-0.5	0.5	-1.5	0.5	-0.5	0.5	-0.5	1.5	-0.5
1.0	-0.5	0.5	-1.0	0.5	0.0	0.5	-1.0	0.5	-1.0
0.5	-0.5	1.0	-0.5	0.5	-0.5	0.5	-0.5	1.0	-0.5
0.5	-0.5	1.5	-0.5	0.5	-0.5	0.5	-1.0	0.5	-1.0
0.5	-1.5	0.5	-0.5	0.5	-0.5	1.0	-1.0	1.0	-0.5
0.5	-0.5	0.5	-0.5	0.5	-0.5	0.5	-0.5	0.5	-0.5
1.0	-0.5	1.0	-0.5	0.5	-1.0	0.5	-0.5	0.5	-0.5
0.5	-0.5	1.0	-1.0	1.0	-1.0	0.5	0.0	0.5	-0.5
0.5	-1.0	0.5	-1.0	0.5	-1.5	0.5	-0.5	1.5	-0.5
0.5	-0.5	0.5	1.0	0.5	-2.0	0.5	-0.5	1.5	-0.5
1.5	-0.5	1.0	-0.5	1.0	-4.0	0.5	-1.0	0.5	-1.0
0.5	-0.5	0.5	-0.5	0.5	0.0	1.0	-0.5	0.5	-0.5
0.5	-0.5	1.0	0.0	-0.5	1.0	-0.5	0.5	-0.5	0.5
-0.5	0.5	-0.5	0.5	-0.5	1.0	-1.0	0.5	-0.5	0.5
-0.5	1.0	-1.0	1.0	-1.0	1.0	-1.0	1.5	-1.0	1.0
-1.0	0.5	-1.0	0.5	-1.0	0.5	-1.0	0.5	-0.5	0.5
-1.5	1.0	-1.0	1.5	-1.0	2.5	-0.5	1.5	-0.5	1.0
-0.5	0.5	-0.5	0.5	-0.5					

AVE. VARIATION = 0.0DB STANDARD DEVIATION = 1.3

VARIATIONS RUN 20 ROLL06 PITCH00
COURSE 000 E&M DIR. 149 DIST 10.49
GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-7.25	0.0
-6.75	0.0
-6.25	0.0
-5.75	1.0
-5.25	0.0
-4.75	0.0
-4.25	2.0
-3.75	2.0
-3.25	2.0
-2.75	2.0
-2.25	1.0
-1.75	5.0
-1.25	41.0
-0.75	105.0
-0.25	150.0
0.25	6.0
0.75	149.0
1.25	111.0
1.75	41.0
2.25	5.0
2.75	6.0
3.25	3.0
3.75	1.0
4.25	1.0
4.75	0.0
5.25	0.0
5.75	0.0
6.25	0.0
6.75	0.0
7.25	1.0

NEGATIVE VALUES MEAN = -0.93
POSITIVE VALUES MEAN = 0.93
NEGATIVE VARIANCE = 0.46
POSITIVE VARIANCE = 0.40
NEGATIVE STANDARD DEVIATION = 0.68
POSITIVE STANDARD DEVIATION = 0.63



X-SCALE=5.00E+00 UNITS INCH.
Y-SCALE=5.00E+01 UNITS INCH.
VARIATIONS RUN 20 RØLL06 PITCH00
COURSE 000 E&M DIR. 149 DIST 10.49

VARIATIONS RUN 20 ROLL06 PITCH00
COURSE 000 E&M DIR. 149 DIST 10.49

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
7.00	0.998
6.50	0.998
6.00	0.998
5.50	0.997
5.00	0.997
4.50	0.997
4.00	0.992
3.50	0.987
3.00	0.980
2.50	0.967
2.00	0.957
1.50	0.885
1.00	0.646
0.50	0.246

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	031 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	1
DIRECTION OF SEA	=	000 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
.0	.5	28.868
.0	1.0	28.870
.0	1.5	28.873
.0	1.9	28.877
.0	2.3	28.881
.0	2.6	28.885
.0	2.8	28.889
.0	3.0	28.891
.0	3.0	28.891
.0	3.0	28.891
.0	2.8	28.889
.0	2.6	28.885
.0	2.3	28.881
.0	1.9	28.877
.0	1.5	28.873
.0	1.0	28.870
.0	.5	28.868
.0	-.5	28.868
.0	-1.0	28.870
.0	-1.5	28.873
.0	-1.9	28.877
.0	-2.3	28.881
.0	-2.6	28.885
.0	-2.8	28.889
.0	-3.0	28.891
.0	-3.0	28.891
.0	-3.0	28.891
.0	-2.8	28.889
.0	-2.6	28.885
.0	-2.3	28.881
.0	-1.9	28.877
.0	-1.5	28.873
.0	-1.0	28.870
.0	-.5	28.868

AVERAGE VALUE =-28.88 DB

DISTRIBUTION RUN52 ROLL00 PITCH03
COURSE 180 E&M DIR. 149 DIST 10.94

DATA POINTS

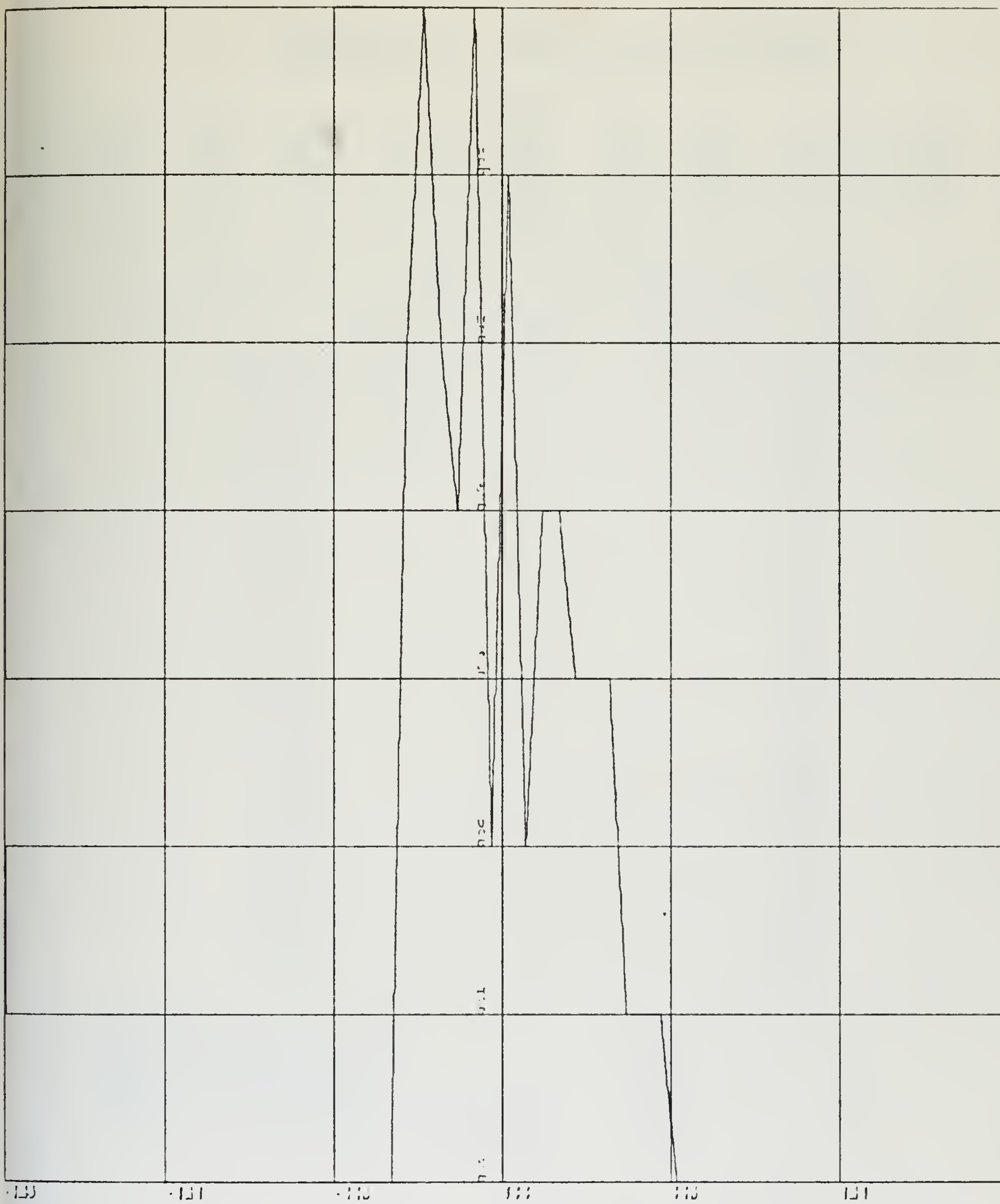
83.5	81.0	85.0	79.5	83.0	80.0	84.5	80.0	85.0
80.5	84.5	81.0	83.5	80.0	84.0	82.0	85.5	79.0
86.0	79.0	83.0	79.5	86.5	81.0	83.0	80.5	82.0
79.0	79.5	79.0	85.0	79.5	84.5	79.5	82.5	79.5
83.5	79.5	82.0	80.0	81.5	80.0	84.0	80.5	83.0
81.5	83.5	81.0	82.0	81.0	82.0	80.5	82.0	81.0
82.5	79.0	84.0	81.0					

AVERAGE POWER = 81.8DB STANDARD DEVIATION = 4.3

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-5.25	0.0
-4.75	0.0
-4.25	0.0
-3.75	0.0
-3.25	0.0
-2.75	5.0
-2.25	7.0
-1.75	5.0
-1.25	4.0
-0.75	7.0
-0.25	2.0
0.25	6.0
0.75	2.0
1.25	4.0
1.75	4.0
2.25	3.0
2.75	3.0
3.25	3.0
3.75	1.0
4.25	1.0
4.75	1.0
5.25	0.0

NEGATIVE VALUES MEAN = -1.69
POSITIVE VALUES MEAN = 1.81
NEGATIVE VARIANCE = 0.65
POSITIVE VARIANCE = 1.70
NEGATIVE STANDARD DEVIATION = 0.81
POSITIVE STANDARD DEVIATION = 1.30



X-SCALE=5.00E+00 UNITS INCH.
Y-SCALE=1.00E+00 UNITS INCH.
DISTRIBUTION RUN52 ROLL00 PITCH03
COURSE 180 E&M DIR. 149 DIST 10.94

VARIATIONS RUN52 ROLL00 PITCH03
COURSE 180 E&M DIR. 149 DIST 10.94

VARIATIONS

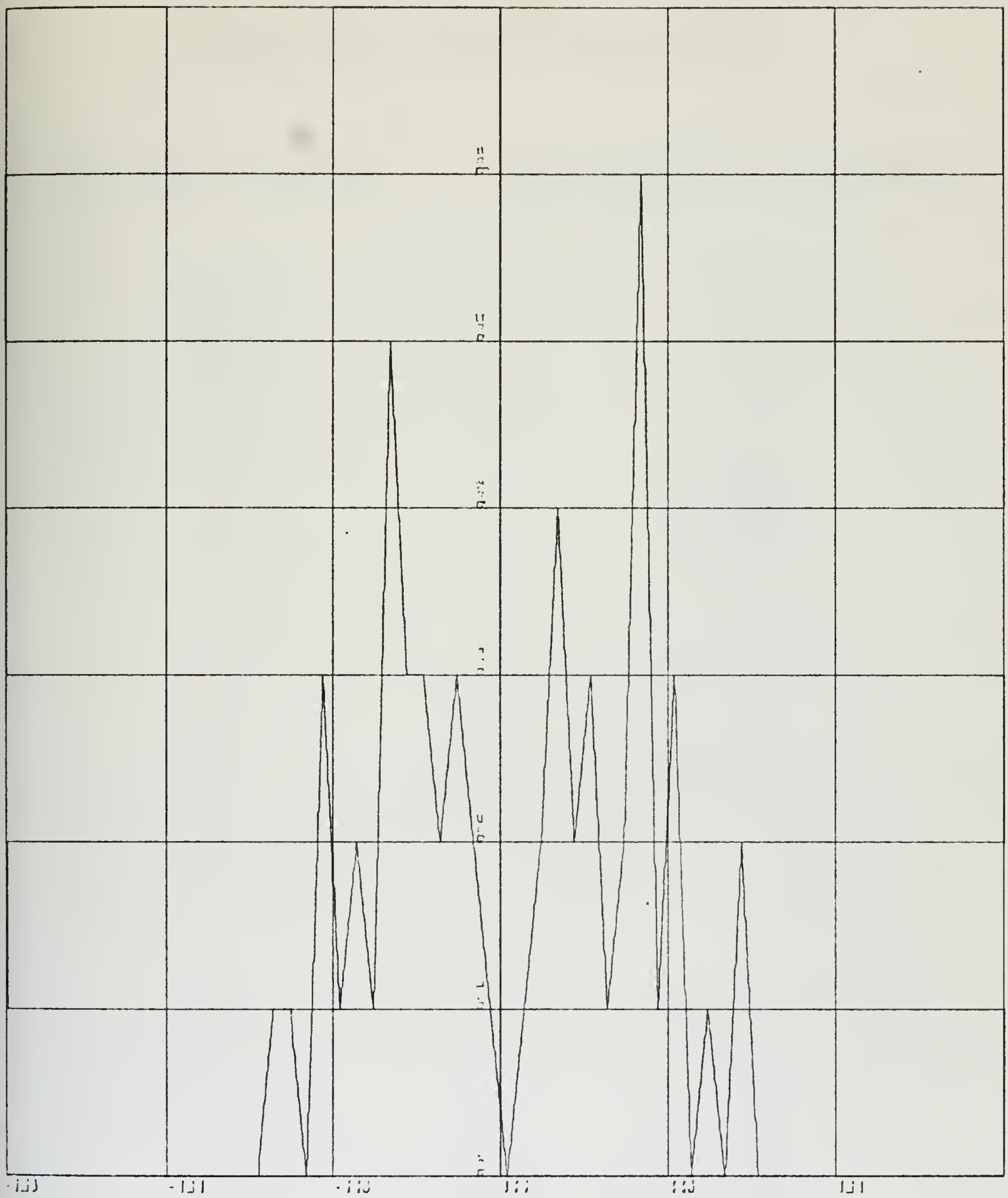
-2.5	4.0	-5.5	3.5	-3.0	4.5	-4.5	5.0	-4.5	4.0
-3.5	2.5	-3.5	4.0	-2.0	3.5	-6.5	7.0	-7.0	4.0
-3.5	7.0	-5.5	2.0	-2.5	1.5	-3.0	0.5	-0.5	6.0
-5.5	5.0	-5.0	3.0	-3.0	4.0	-4.0	2.5	-2.0	1.5
-1.5	4.0	-3.5	2.5	-1.5	2.0	-2.5	1.0	-1.0	1.0
-1.5	1.5	-1.0	1.5	-3.5	5.0				

AVE. VARIATION = 0.0DB STANDARD DEVIATION = 14.3

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-7.25	0.0
-6.75	1.0
-6.25	1.0
-5.75	0.0
-5.25	3.0
-4.75	1.0
-4.25	2.0
-3.75	1.0
-3.25	5.0
-2.75	3.0
-2.25	3.0
-1.75	2.0
-1.25	3.0
-0.75	2.0
-0.25	1.0
0.25	0.0
0.75	1.0
1.25	2.0
1.75	4.0
2.25	2.0
2.75	3.0
3.25	1.0
3.75	2.0
4.25	6.0
4.75	1.0
5.25	3.0
5.75	0.0
6.25	1.0
6.75	0.0
7.25	2.0

NEGATIVE VALUES MEAN = -3.32
POSITIVE VALUES MEAN = 3.34
NEGATIVE VARIANCE = 2.91
POSITIVE VARIANCE = 3.13
NEGATIVE STANDARD DEVIATION = 1.71
POSITIVE STANDARD DEVIATION = 1.77



K-SCALE=5.00E+00 UNITS INCH.
Y-SCALE=1.00E+00 UNITS INCH.
VARIATIONS RUN52 ROLL00 PITCH03
COURSE 180 E&M DIR. 149 DIST 10.94

VARIATIONS RUN52 ROLL00 PITCH03
COURSE 180 E&M DIR. 149 DIST 10.94

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
7.00	0.964
6.50	0.946
6.00	0.911
5.50	0.911
5.00	0.804
4.50	0.768
4.00	0.625
3.50	0.571
3.00	0.464
2.50	0.357
2.00	0.268
1.50	0.161
1.00	0.071
0.50	0.018

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	211 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	022 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
1.0	.5	3.681
2.0	1.0	1.190
3.0	1.5	2.464
3.9	1.9	3.349
4.6	2.3	2.428
5.2	2.6	1.882
5.6	2.8	1.930
5.9	3.0	2.122
6.0	3.0	2.205
5.9	3.0	2.122
5.6	2.8	1.930
5.2	2.6	1.882
4.6	2.3	2.428
3.9	1.9	3.349
3.0	1.5	2.464
2.0	1.0	1.190
1.0	.5	3.681
-1.0	-.5	3.893
-2.0	-1.0	1.239
-3.0	-1.5	2.255
-3.9	-1.9	3.355
-4.6	-2.3	2.667
-5.2	-2.6	2.006
-5.6	-2.8	1.893
-5.9	-3.0	1.992
-6.0	-3.0	2.049
-5.9	-3.0	1.992
-5.6	-2.8	1.893
-5.2	-2.6	2.006
-4.6	-2.3	2.667
-3.9	-1.9	3.355
-3.0	-1.5	2.255
-2.0	-1.0	1.239
-1.0	-.5	3.893

AVERAGE VALUE = 2.38 DB

DISTRIBUTION RUN54 ROLL06 PITCH03
COURSE 000 E&M DIR. 149 DIST 10.94

DATA POINTS

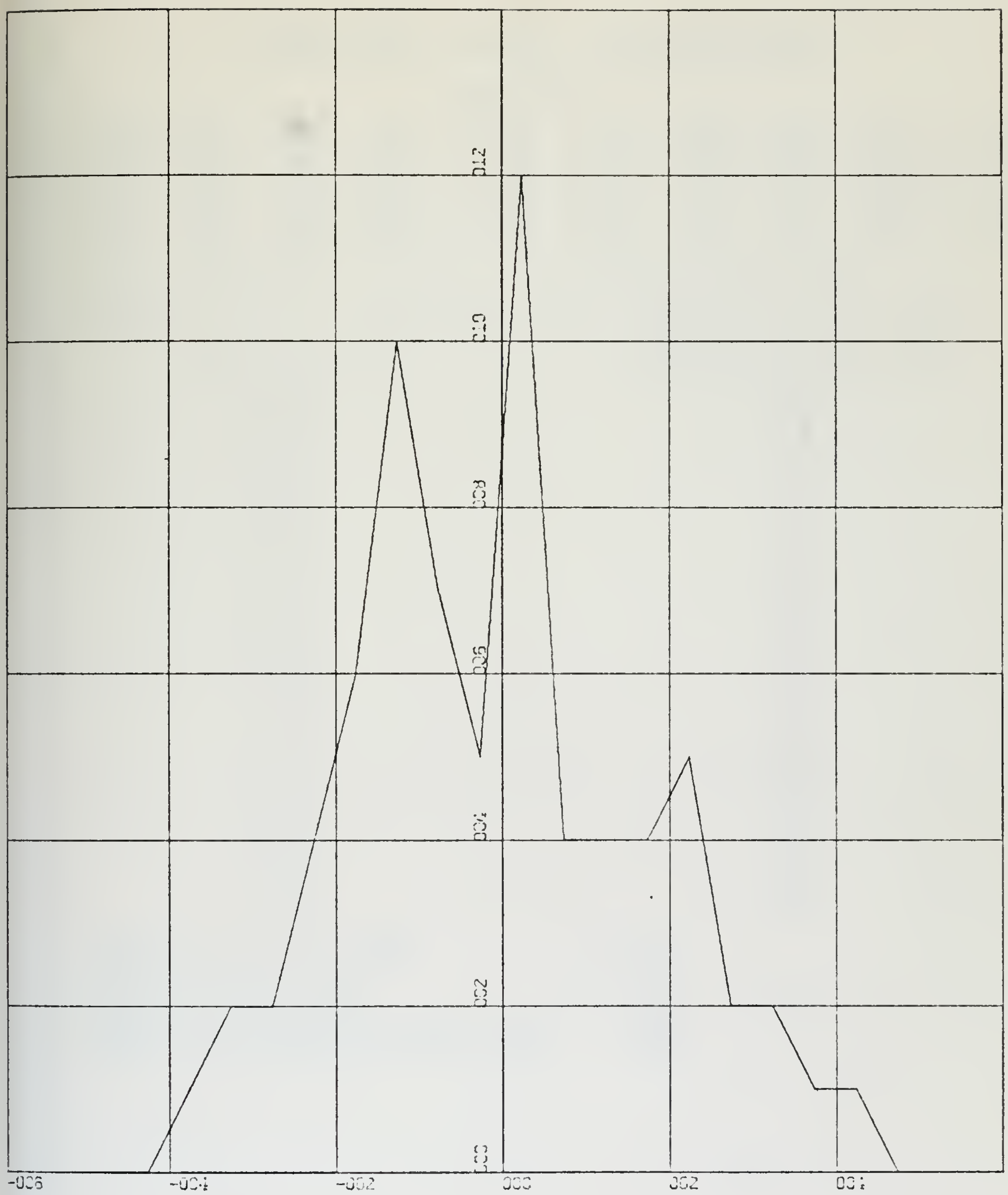
86.0	82.0	84.5	83.0	85.0	82.5	84.0	80.5	79.0
84.0	80.5	82.5	80.0	84.5	82.0	84.0	81.0	83.5
81.0	82.0	79.5	82.0	80.5	82.5	80.0	83.5	80.5
81.5	79.5	82.0	81.0	82.0	79.5	82.5	79.0	81.5
80.0	81.5	80.5	83.0	80.0	82.0	81.0	82.0	80.5
81.5	80.0	83.0	80.5	83.0	81.0	85.5	81.0	83.5
80.5	82.0	80.5	81.5	79.5	85.0	80.0	83.5	81.0
82.0	80.5	84.0	78.5	82.0	78.5	84.0	78.0	82.0

AVERAGE POWER = 81.7DB STANDARD DEVIATION = 3.2

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-5.25	0.0
-4.75	0.0
-4.25	0.0
-3.75	1.0
-3.25	2.0
-2.75	2.0
-2.25	4.0
-1.75	6.0
-1.25	10.0
-0.75	7.0
-0.25	5.0
0.25	12.0
0.75	4.0
1.25	4.0
1.75	4.0
2.25	5.0
2.75	2.0
3.25	2.0
3.75	1.0
4.25	1.0
4.75	0.0
5.25	0.0

NEGATIVE VALUES MEAN = -1.40
POSITIVE VALUES MEAN = 1.48
NEGATIVE VARIANCE = 0.81
POSITIVE VARIANCE = 1.35
NEGATIVE STANDARD DEVIATION = 0.90
POSITIVE STANDARD DEVIATION = 1.16



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=2.00E+00 UNITS INCH.
DISTRIBUTION RUN54 ROLL06 PITCH03
COURSE 000 E&M DIR. 149 DIST 10.94

VARIATIONS RUN54 ROLL06 PITCH03
COURSE 000 E&M DIR. 149 DIST 10.94

VARIATIONS

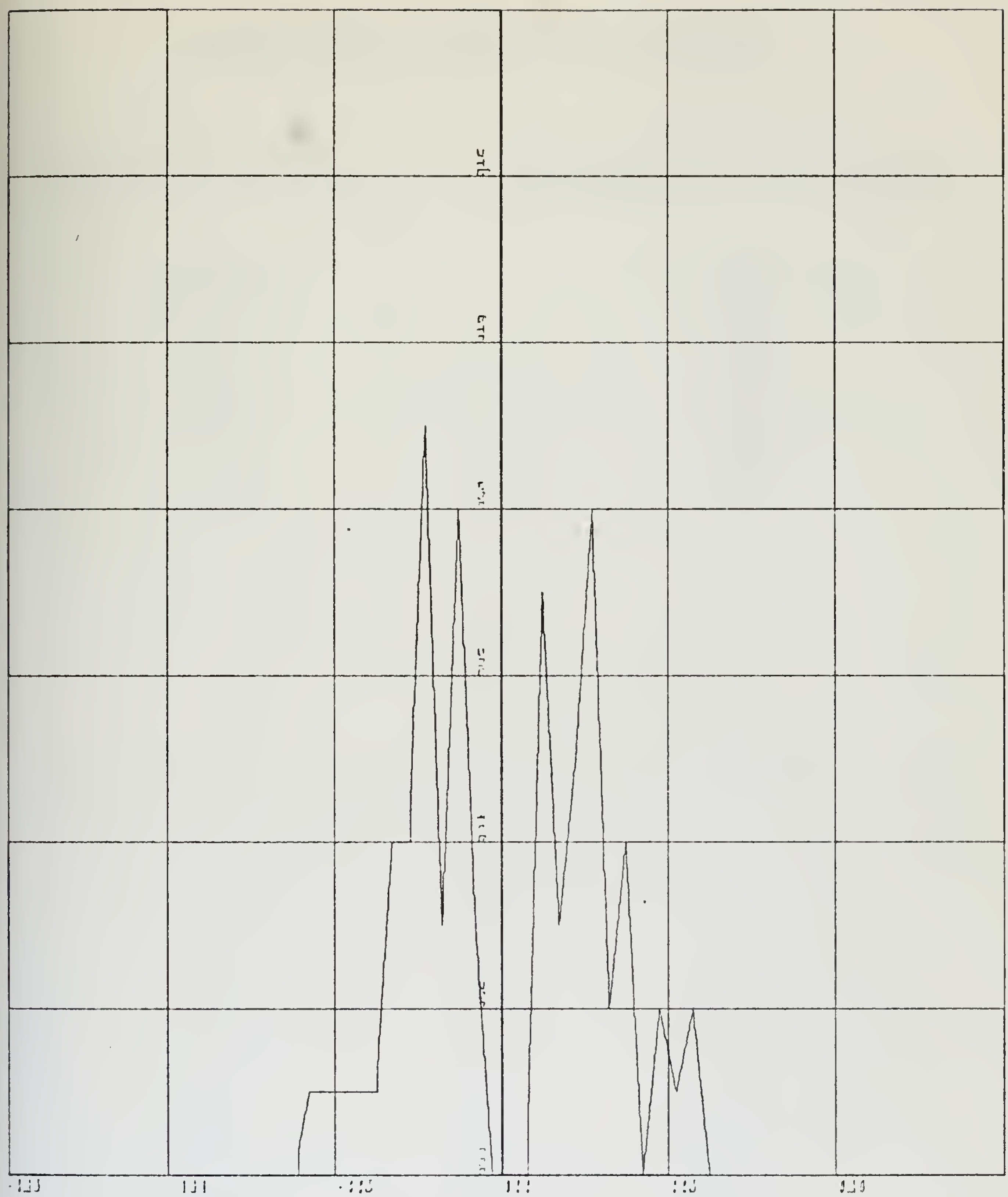
-4.0	2.5	-1.5	2.0	-2.5	1.5	-3.5	-1.5	5.0	-3.5
2.0	-2.5	4.5	-2.5	2.0	-3.0	2.5	-2.5	1.0	-2.5
2.5	-1.5	2.0	-2.5	3.5	-3.0	1.0	-2.0	2.5	-1.0
1.0	-2.5	3.0	-3.5	2.5	-1.5	1.5	-1.0	2.5	-3.0
2.0	-1.0	1.0	-1.5	1.0	-1.5	3.0	-2.5	2.5	-2.0
4.5	-4.5	2.5	-3.0	1.5	-1.5	1.0	-2.0	5.5	-5.0
3.5	-2.5	1.0	-1.5	3.5	-5.5	3.5	-3.5	5.5	-6.0

AVE. VARIATION = -0.1DB STANDARD DEVIATION = 8.4

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-6.25	0.0
-5.75	1.0
-5.25	1.0
-4.75	1.0
-4.25	1.0
-3.75	1.0
-3.25	4.0
-2.75	4.0
-2.25	9.0
-1.75	3.0
-1.25	8.0
-0.75	3.0
-0.25	0.0
0.25	0.0
0.75	0.0
1.25	7.0
1.75	3.0
2.25	5.0
2.75	8.0
3.25	2.0
3.75	4.0
4.25	0.0
4.75	2.0
5.25	1.0
5.75	2.0
6.25	0.0

NEGATIVE VALUES MEAN = -2.62
POSITIVE VALUES MEAN = 2.54
NEGATIVE VARIANCE = 1.53
POSITIVE VARIANCE = 1.72
NEGATIVE STANDARD DEVIATION = 1.24
POSITIVE STANDARD DEVIATION = 1.31



X-SCALE=5.00E+00 UNITS INCH.
Y-SCALE=2.00E+00 UNITS INCH.
VARIATIONS   RUN54 ROLL05 PITCH03
COURSE 000 E&M DIR. 149 DIST 10.94

VARIATIONS RUN54 ROLL06 PITCH03
COURSE 000 E&M DIR. 149 DIST 10.94

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
6.00	1.000
5.50	0.957
5.00	0.929
4.50	0.886
4.00	0.871
3.50	0.800
3.00	0.714
2.50	0.543
2.00	0.343
1.50	0.257
1.00	0.043
0.50	0.0

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	301 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	1
DIRECTION OF SEA	=	049 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
1.0	.0	3.635
2.1	.0	1.182
3.0	.0	2.494
3.9	.0	3.305
4.6	.0	2.340
5.2	.0	1.823
5.7	.0	1.903
5.9	.0	2.109
6.0	.0	2.194
5.9	.0	2.109
5.7	.0	1.903
5.2	.0	1.823
4.6	.0	2.340
3.9	.0	3.305
3.0	.0	2.494
2.1	.0	1.182
1.0	.0	3.635
-1.0	.0	3.849
-2.1	.0	1.231
-3.0	.0	2.288
-3.9	.0	3.335
-4.6	.0	2.586
-5.2	.0	1.941
-5.7	.0	1.857
-5.9	.0	1.974
-6.0	.0	2.036
-5.9	.0	1.974
-5.7	.0	1.857
-5.2	.0	1.941
-4.6	.0	2.586
-3.9	.0	3.335
-3.0	.0	2.288
-2.1	.0	1.231
-1.0	.0	3.849

AVERAGE VALUE = 2.35 DB

DISTRIBUTION RUN55 ROLL06 PITCH00
COURSE 090 E&M DIR. 149 DIST 10.94

DATA POINTS

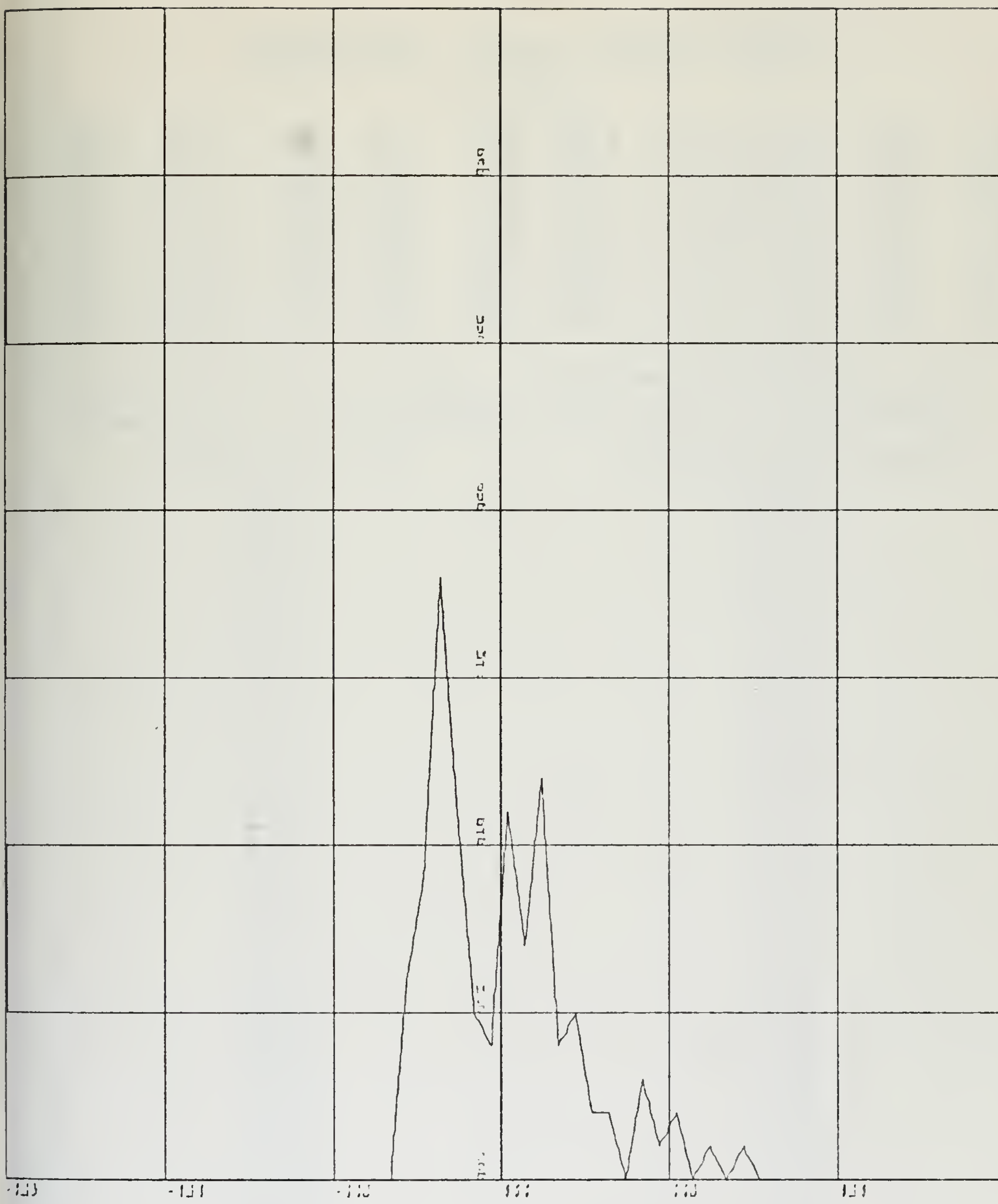
79.0	82.0	80.0	81.5	79.0	82.0	81.0	84.5	78.0
82.5	77.5	84.0	78.5	84.0	78.0	81.5	78.0	81.0
77.5	80.5	79.5	80.5	78.0	80.5	79.0	80.0	77.5
81.0	78.0	80.5	78.5	84.0	79.5	83.0	77.5	82.0
77.5	81.0	77.0	80.5	78.5	81.0	77.0	81.0	78.5
79.5	78.5	80.0	78.5	80.0	79.0	80.0	77.0	83.0
78.0	81.0	77.0	85.0	78.0	79.0	78.0	82.5	77.5
86.0	78.5	80.0	78.0	81.0	77.5	81.5	78.0	81.0
78.0	80.0	78.0	87.0	78.0	80.0	77.5	85.0	78.5
81.0	78.0	82.0	78.5	80.0	77.0	80.0	78.5	80.5
77.0	79.5	78.0	81.5	78.0	80.0	78.0	80.5	78.0
82.0	78.5	81.0	77.5	81.0				

AVERAGE POWER = 79.8DB STANDARD DEVIATION = 4.7

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-8.25	0.0
-7.75	0.0
-7.25	0.0
-6.75	0.0
-6.25	0.0
-5.75	0.0
-5.25	0.0
-4.75	0.0
-4.25	0.0
-3.75	0.0
-3.25	0.0
-2.75	6.0
-2.25	9.0
-1.75	18.0
-1.25	11.0
-0.75	5.0
-0.25	4.0
0.25	11.0
0.75	7.0
1.25	12.0
1.75	4.0
2.25	5.0
2.75	2.0
3.25	2.0
3.75	0.0
4.25	3.0
4.75	1.0
5.25	2.0
5.75	0.0
6.25	1.0
6.75	0.0
7.25	1.0
7.75	0.0
8.25	0.0

NEGATIVE VALUES MEAN = -1.71
POSITIVE VALUES MEAN = 1.78
NEGATIVE VARIANCE = 0.47
POSITIVE VARIANCE = 2.89
NEGATIVE STANDARD DEVIATION = 0.68
POSITIVE STANDARD DEVIATION = 1.70



X-SCALE=5.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
DISTRIBUTION RUN55 ROLL06 PITCH00
COURSE 090 E&M DIR. 149 DIST 10.94

VARIATIONS RUN55 ROLL06 PITCH00
COURSE 090 E&M DIR. 149 DIST 10.94

VARIATIONS

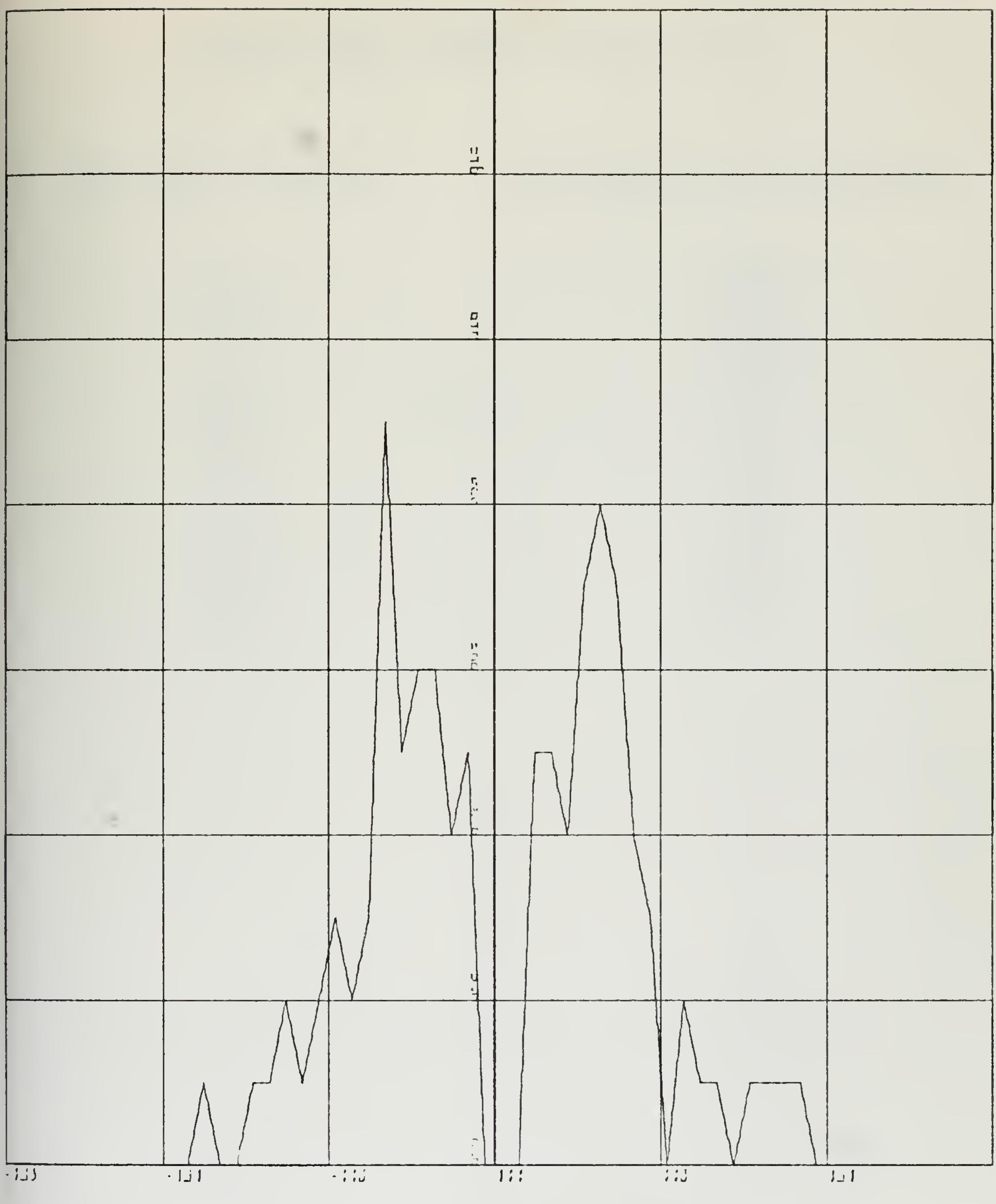
3.0	-2.0	1.5	-2.5	3.0	-1.0	3.5	-6.5	4.5	-5.0
6.5	-5.5	5.5	-6.0	3.5	-3.5	3.0	-3.5	3.0	-1.0
1.0	-2.5	2.5	-1.5	1.0	-2.5	3.5	-3.0	2.5	-2.0
5.5	-4.5	3.5	-5.5	4.5	-4.5	3.5	-4.0	3.5	-2.0
2.5	-4.0	4.0	-2.5	1.0	-1.0	1.5	-1.5	1.5	-1.0
1.0	-3.0	6.0	-5.0	3.0	-4.0	8.0	-7.0	1.0	-1.0
4.5	-5.0	8.5	-7.5	1.5	-2.0	3.0	-3.5	4.0	-3.5
3.0	-3.0	2.0	-2.0	9.0	-9.0	2.0	-2.5	7.5	-6.5
2.5	-3.0	4.0	-3.5	1.5	-3.0	3.0	-1.5	2.0	-3.5
2.5	-1.5	3.5	-3.5	2.0	-2.0	2.5	-2.5	4.0	-3.5
2.5	-3.5								

AVE. VARIATION = -0.0DB   STANDARD DEVIATION = 15.2

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-9.25	0.0
-8.75	1.0
-8.25	0.0
-7.75	0.0
-7.25	1.0
-6.75	1.0
-6.25	2.0
-5.75	1.0
-5.25	2.0
-4.75	3.0
-4.25	2.0
-3.75	3.0
-3.25	9.0
-2.75	5.0
-2.25	6.0
-1.75	6.0
-1.25	4.0
-0.75	5.0
-0.25	0.0
0.25	0.0
0.75	0.0
1.25	5.0
1.75	5.0
2.25	4.0
2.75	7.0
3.25	8.0
3.75	7.0
4.25	4.0
4.75	3.0
5.25	0.0
5.75	2.0
6.25	1.0
6.75	1.0
7.25	0.0
7.75	1.0
8.25	1.0
8.75	1.0
9.25	1.0

NEGATIVE VALUES MEAN = -3.41
POSITIVE VALUES MEAN = 3.38
NEGATIVE VARIANCE = 3.36
POSITIVE VARIANCE = 3.75
NEGATIVE STANDARD DEVIATION = 1.83
POSITIVE STANDARD DEVIATION = 1.94



X-SCALE=5.00E+00 UNITS INCH.
Y-SCALE=2.00E+00 UNITS INCH.
VARIATIONS RUN55 ROLL06 PITCH00
COURSE 090 E&M DIR. 149 DIST 10.94

VARIATIONS RUN55 ROLL06 PITCH00
COURSE 090 E&M DIR. 149 DIST 10.94

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
9.00	0.990
8.50	0.971
8.00	0.961
7.50	0.951
7.00	0.941
6.50	0.922
6.00	0.892
5.50	0.863
5.00	0.843
4.50	0.784
4.00	0.725
3.50	0.627
3.00	0.461
2.50	0.343
2.00	0.245
1.50	0.137
1.00	0.049
0.50	0.0

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	010 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	061 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
2.4	.0	1.455
4.8	.0	2.214
7.0	.0	2.963
9.0	.0	2.240
10.7	.0	2.720
12.1	.0	2.306
13.1	.0	2.683
13.8	.0	2.780
14.0	.0	2.751
13.8	.0	2.780
13.1	.0	2.683
12.1	.0	2.306
10.7	.0	2.720
9.0	.0	2.240
7.0	.0	2.963
4.8	.0	2.214
2.4	.0	1.455
-2.4	.0	1.383
-4.8	.0	2.422
-7.0	.0	2.896
-9.0	.0	2.155
-10.7	.0	2.810
-12.1	.0	2.323
-13.1	.0	2.472
-13.8	.0	2.704
-14.0	.0	2.750
-13.8	.0	2.704
-13.1	.0	2.472
-12.1	.0	2.323
-10.7	.0	2.810
-9.0	.0	2.155
-7.0	.0	2.896
-4.8	.0	2.422
-2.4	.0	1.383

AVERAGE VALUE = 2.43 DB

DISTRIBUTION RUN56 ROLL14 PITCH00
COURSE 160 E&M DIR. 150 DIST 9.21

DATA POINTS

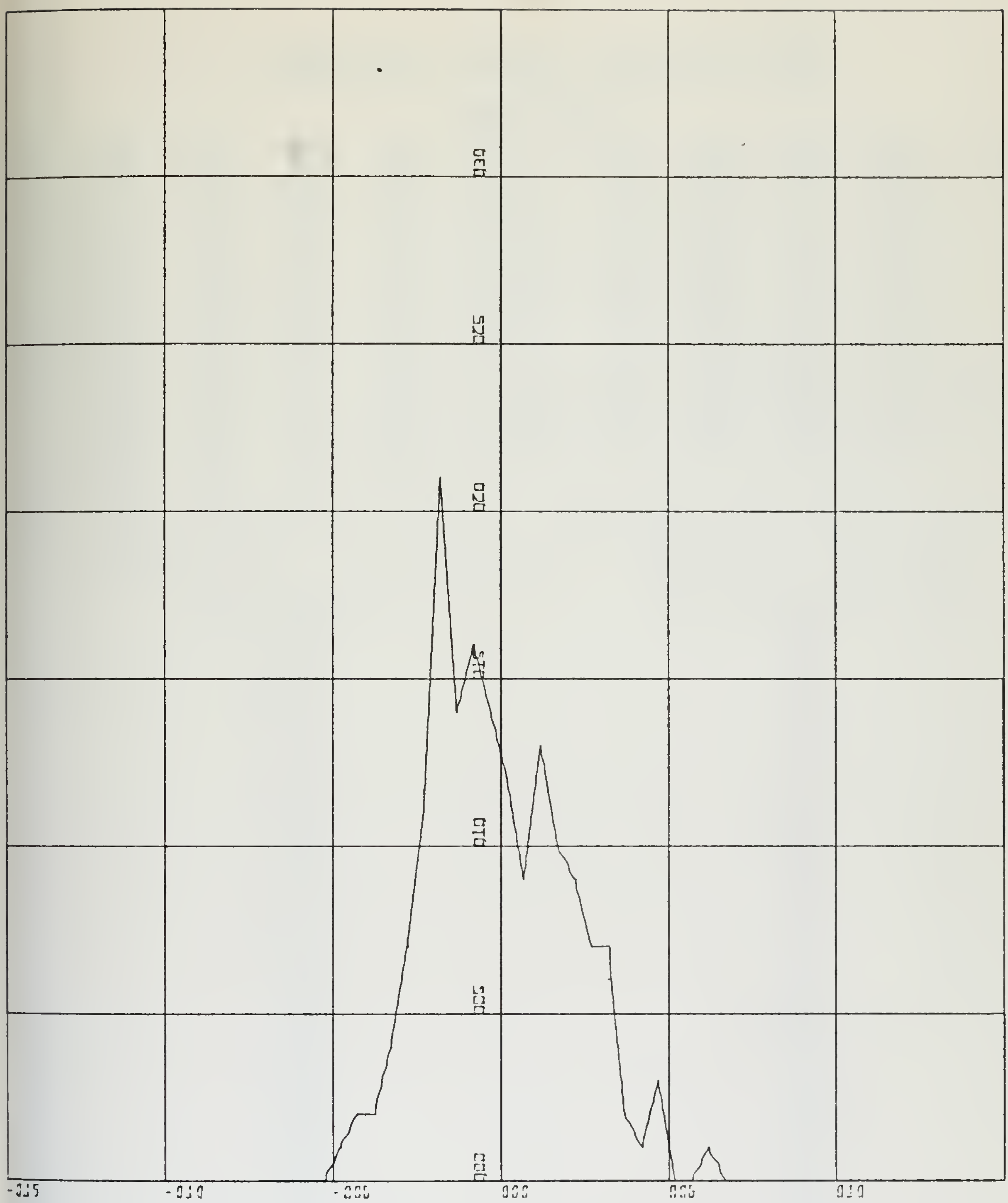
78.5	80.0	79.0	79.5	78.5	81.0	77.0	78.5	77.5
79.0	77.0	82.0	79.0	83.0	80.5	78.0	81.0	77.5
82.5	79.0	79.5	78.5	81.0	79.0	81.0	80.0	80.5
80.0	80.5	79.5	82.0	79.5	80.5	79.5	80.0	79.5
82.0	79.0	82.0	79.0	83.5	81.5	82.5	78.0	83.0
80.0	81.0	80.5	81.5	80.5	82.0	79.0	82.5	79.0
81.5	78.5	82.5	79.0	84.0	78.0	83.0	79.5	82.0
79.0	85.5	81.0	82.0	80.0	81.5	79.0	84.0	79.0
84.0	80.5	82.5	79.5	84.5	80.0	83.5	78.5	83.0
79.0	83.0	80.0	87.0	79.0	83.5	81.0	82.0	79.0
83.5	79.5	82.0	81.5	82.5	80.0	84.0	80.5	84.5
82.5	83.5	81.0	83.0	79.5	83.5	79.0	84.0	78.5
84.0	79.5	80.0	79.0	82.0	81.5	82.0	80.0	78.5
85.0	79.0	83.0	81.5	82.0	78.0	85.5	80.0	81.0
79.0	85.5	77.5	81.0	80.5	83.0	78.5	82.5	80.0
83.5	80.5	81.5	80.0	81.0	80.0	80.5	79.5	81.5
78.5	84.0	77.5	82.5	79.0	83.0	79.5	80.5	78.5
80.5	82.5	78.0	82.0	78.0	80.5	76.0	81.0	76.5
78.0	80.0	76.5	79.5					

AVERAGE POWER = 80.7DB   STANDARD DEVIATION = 4.3

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-7.25	0.0
-6.75	0.0
-6.25	0.0
-5.75	0.0
-5.25	0.0
-4.75	1.0
-4.25	2.0
-3.75	2.0
-3.25	4.0
-2.75	7.0
-2.25	11.0
-1.75	21.0
-1.25	14.0
-0.75	16.0
-0.25	14.0
0.25	12.0
0.75	9.0
1.25	13.0
1.75	10.0
2.25	9.0
2.75	7.0
3.25	7.0
3.75	2.0
4.25	1.0
4.75	3.0
5.25	0.0
5.75	0.0
6.25	1.0
6.75	0.0
7.25	0.0

NEGATIVE VALUES MEAN = -1.55
POSITIVE VALUES MEAN = 1.92
NEGATIVE VARIANCE = 1.07
POSITIVE VARIANCE = 1.71
NEGATIVE STANDARD DEVIATION = 1.03
POSITIVE STANDARD DEVIATION = 1.31



X-SCALE=5.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
DISTRIBUTION RUN56 ROLL14 PITCH00
COURSE 160 E&M DIR. 150 DIST 9.21

VARIATIONS RUN56 ROLL14 PITCH00
COURSE 160 E&M DIR. 150 DIST 9.21

VARIATIONS

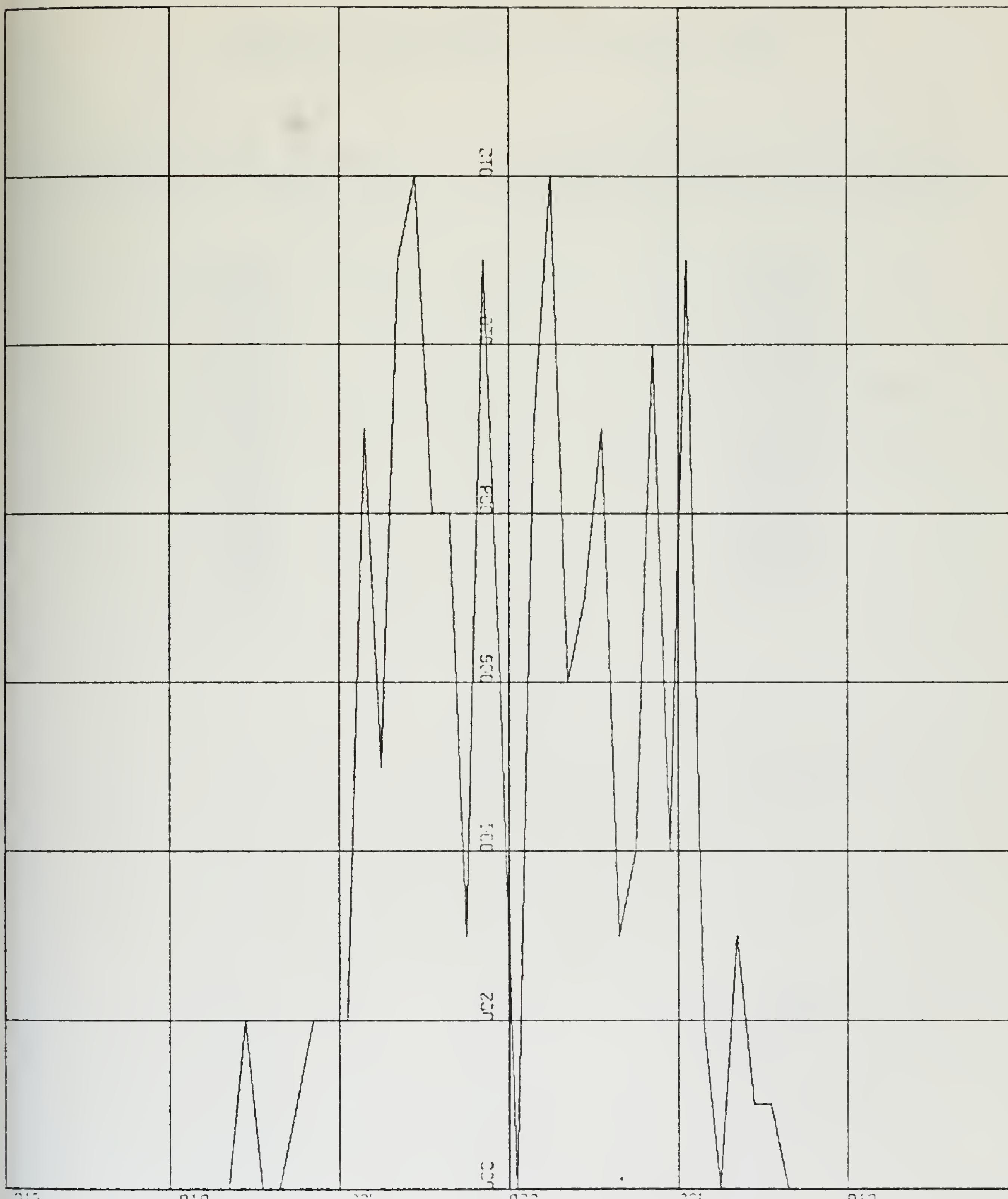
1.5	-1.0	0.5	-1.0	2.5	-4.0	1.5	-1.0	1.5	-2.0
5.0	-3.0	4.0	-2.5	-2.5	3.0	-3.5	5.0	-3.5	0.5
-1.0	2.5	-2.0	2.0	-1.0	0.5	-0.5	0.5	-1.0	2.5
-2.5	1.0	-1.0	0.5	-0.5	2.5	-3.0	3.0	-3.0	4.5
-2.0	1.0	-4.5	5.0	-3.0	1.0	-0.5	1.0	-1.0	1.5
-3.0	3.5	-3.5	2.5	-3.0	4.0	-3.5	5.0	-6.0	5.0
-3.5	2.5	-3.0	6.5	-4.5	1.0	-2.0	1.5	-2.5	5.0
-5.0	5.0	-3.5	2.0	-3.0	5.0	-4.5	3.5	-5.0	4.5
-4.0	4.0	-3.0	7.0	-8.0	4.5	-2.5	1.0	-3.0	4.5
-4.0	2.5	-0.5	1.0	-2.5	4.0	-3.5	4.0	-2.0	1.0
-2.5	2.0	-3.5	4.0	-4.5	5.0	-5.5	5.5	-4.5	0.5
-1.0	3.0	-0.5	0.5	-2.0	-1.5	6.5	-6.0	4.0	-1.5
0.5	-4.0	7.5	-5.5	1.0	-2.0	6.5	-8.0	3.5	-0.5
2.5	-4.5	4.0	-2.5	3.5	-3.0	1.0	-1.5	1.0	-1.0
0.5	-1.0	2.0	-3.0	5.5	-6.5	5.0	-3.5	4.0	-3.5
1.0	-2.0	2.0	2.0	-4.5	4.0	-4.0	2.5	-4.5	5.0
-4.5	1.5	2.0	-3.5						

AVE. VARIATION = -0.0DB STANDARD DEVIATION = 12.0

GRAPHED DATA IS; VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-8.25	0.0
-7.75	2.0
-7.25	0.0
-6.75	0.0
-6.25	1.0
-5.75	2.0
-5.25	2.0
-4.75	2.0
-4.25	9.0
-3.75	5.0
-3.25	11.0
-2.75	12.0
-2.25	8.0
-1.75	8.0
-1.25	3.0
-0.75	11.0
-0.25	6.0
0.25	0.0
0.75	9.0
1.25	12.0
1.75	6.0
2.25	7.0
2.75	9.0
3.25	3.0
3.75	4.0
4.25	10.0
4.75	4.0
5.25	11.0
5.75	2.0
6.25	0.0
6.75	3.0
7.25	1.0
7.75	1.0
8.25	0.0

NEGATIVE VALUES MEAN = -2.99
POSITIVE VALUES MEAN = 2.96
NEGATIVE VARIANCE = 2.80
POSITIVE VARIANCE = 3.41
NEGATIVE STANDARD DEVIATION = 1.67
POSITIVE STANDARD DEVIATION = 1.85



X-SCALE=5.00E+00 UNITS INCH.
Y-SCALE=2.00E+00 UNITS INCH.
VARIATIØNS RUN56 RØLL14 PITCH00
CØURSE 160 E&M DIR. 150 DIST 9.21

VARIATIONS   RUN56 ROLL14 PITCH00
COURSE 160 E&M DIR. 150 DIST 9.21

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
8.00	1.000
7.50	0.982
7.00	0.976
6.50	0.957
6.00	0.951
5.50	0.927
5.00	0.848
4.50	0.811
4.00	0.695
3.50	0.640
3.00	0.555
2.50	0.427
2.00	0.335
1.50	0.250
1.00	0.159
0.50	0.037

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	298 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	018 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
.9	.0	4.874
1.7	.0	1.450
2.5	.0	1.487
3.2	.0	2.803
3.8	.0	3.345
4.3	.0	2.842
4.6	.0	2.307
4.9	.0	2.045
4.9	.0	1.976
4.9	.0	2.045
4.6	.0	2.307
4.3	.0	2.842
3.8	.0	3.345
3.2	.0	2.803
2.5	.0	1.487
1.7	.0	1.450
.9	.0	4.874
-.9	.0	5.079
-1.7	.0	1.590
-2.5	.0	1.414
-3.2	.0	2.589
-3.8	.0	3.325
-4.3	.0	3.046
-4.6	.0	2.554
-4.9	.0	2.264
-4.9	.0	2.179
-4.9	.0	2.264
-4.6	.0	2.554
-4.3	.0	3.046
-3.8	.0	3.325
-3.2	.0	2.589
-2.5	.0	1.414
-1.7	.0	1.590
-.9	.0	5.079

AVERAGE VALUE = 2.65 DB

DISTRIBUTION RUN57 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

DATA POINTS

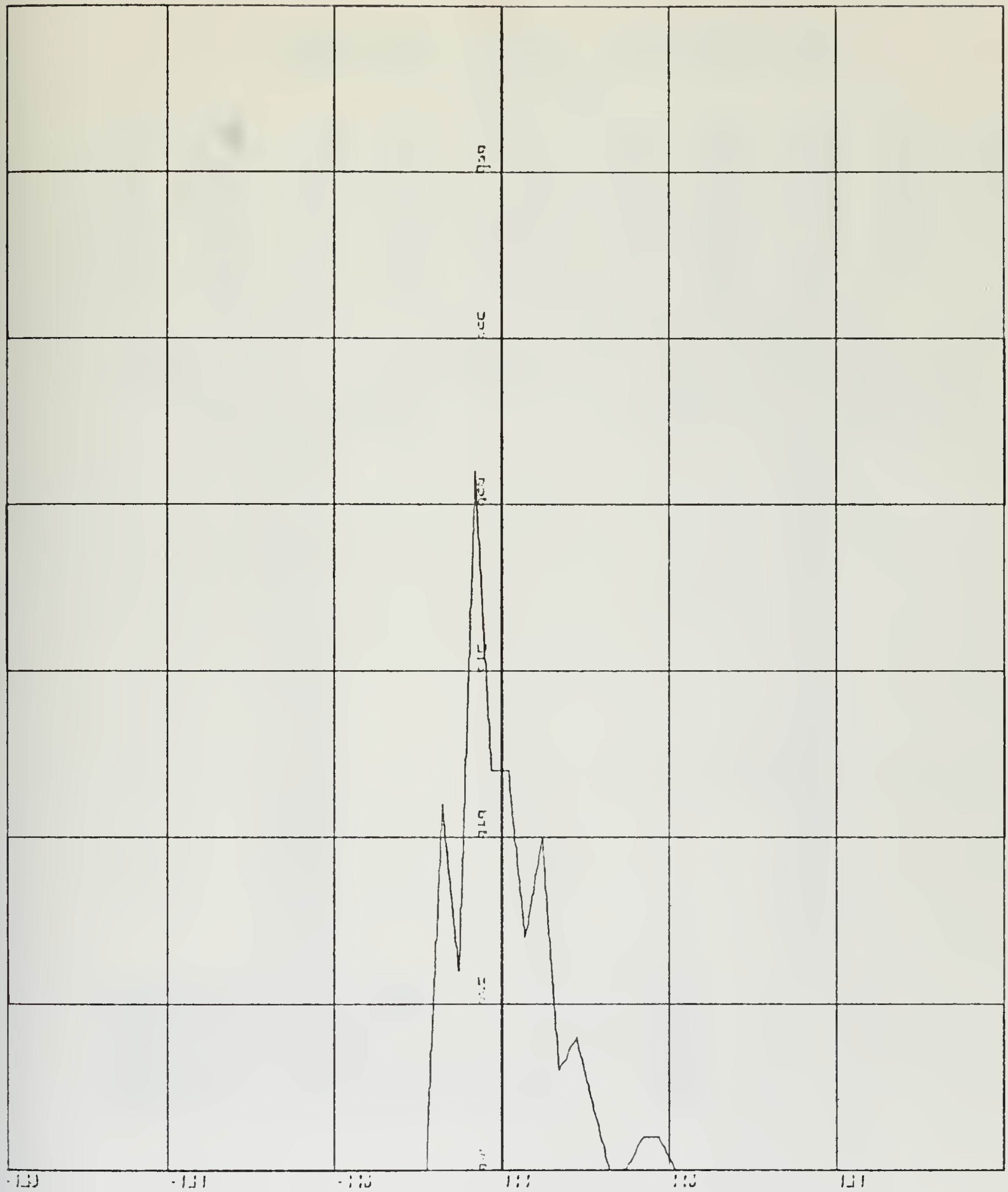
78.0	78.0	78.5	76.5	78.5	76.5	77.5	76.5	78.0
77.0	76.0	78.0	76.5	78.0	76.0	78.0	76.0	79.0
75.5	79.5	76.0	79.5	76.0	79.0	76.5	77.5	76.5
78.0	76.0	77.0	76.5	79.0	76.0	77.5	76.0	77.0
76.0	79.0	76.0	81.5	76.0	81.0	76.0	77.0	75.5
78.5	76.5	78.0	76.0	78.0	76.0	76.0	77.0	76.0
77.0	75.0	77.5	75.0	78.0	76.0	76.5	76.0	77.5
75.5	77.5	75.5	77.0	76.0	77.0	75.5	77.0	75.0
77.0	75.0	76.0	75.0	76.5	75.0	75.5	75.0	76.5
75.0	77.5	76.0	75.0	76.5	75.0	77.0	75.0	77.0

AVERAGE POWER = 76.8DB   STANDARD DEVIATION = 1.8

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-5.25	0.0
-4.75	0.0
-4.25	0.0
-3.75	0.0
-3.25	0.0
-2.75	0.0
-2.25	0.0
-1.75	11.0
-1.25	6.0
-0.75	21.0
-0.25	12.0
0.25	12.0
0.75	7.0
1.25	10.0
1.75	3.0
2.25	4.0
2.75	2.0
3.25	0.0
3.75	0.0
4.25	1.0
4.75	1.0
5.25	0.0

NEGATIVE VALUES MEAN = -0.95
POSITIVE VALUES MEAN = 1.19
NEGATIVE VARIANCE = 0.29
POSITIVE VARIANCE = 1.13
NEGATIVE STANDARD DEVIATION = 0.54
POSITIVE STANDARD DEVIATION = 1.07



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Y-SCALE=5.00E+00 UNITS INCH.
DISTRIBUTION RUN57 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.40

VARIATIONS RUN57 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

VARIATIONS

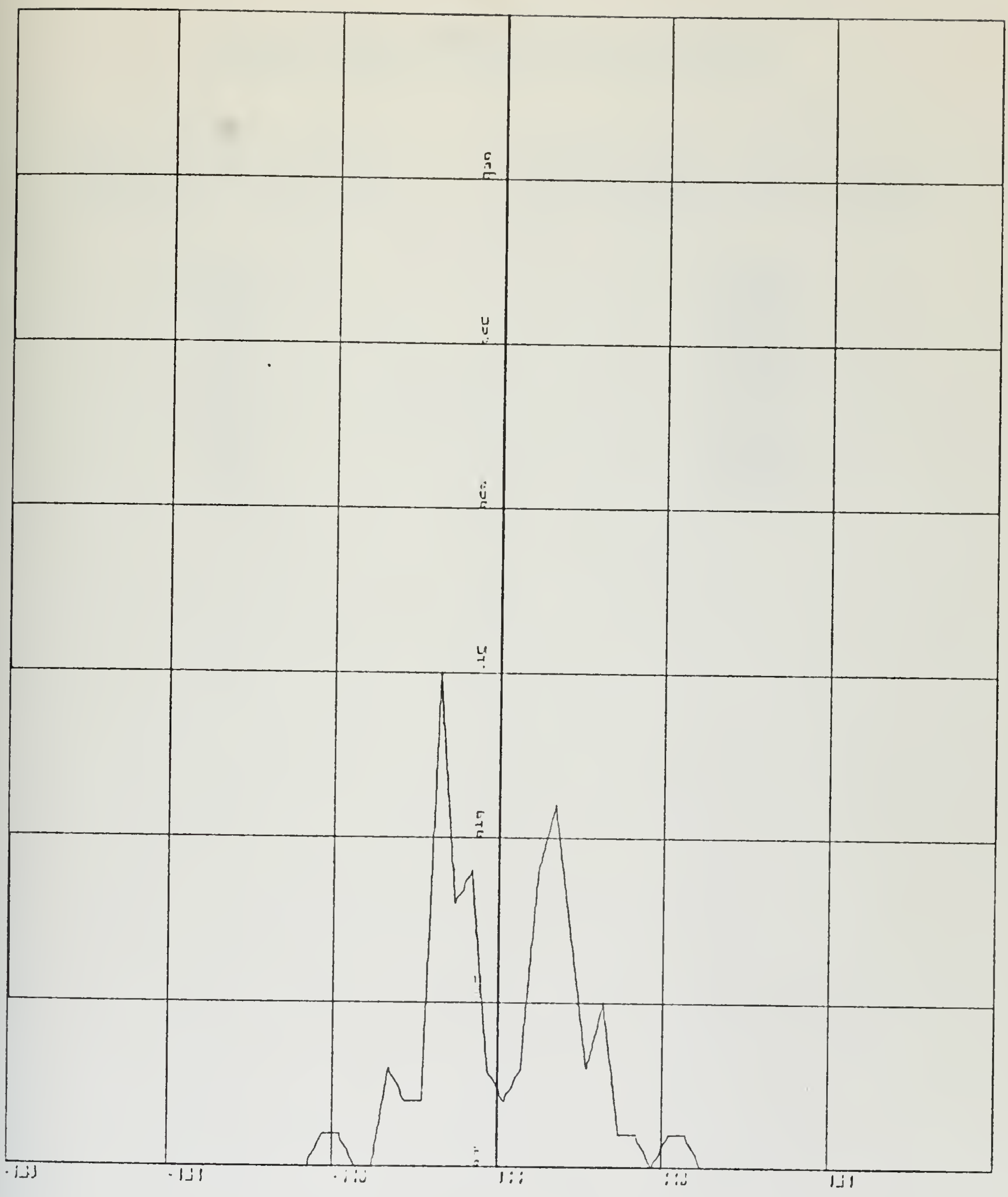
0.0	0.5	-2.0	2.0	-2.0	1.0	-1.0	1.5	-1.0	-1.0
2.0	-1.5	1.5	-2.0	2.0	-2.0	3.0	-3.5	4.0	-3.5
3.5	-3.5	3.0	-2.5	1.0	-1.0	1.5	-2.0	1.0	-0.5
2.5	-3.0	1.5	-1.5	1.0	-1.0	3.0	-3.0	5.5	-5.5
5.0	-5.0	1.0	-1.5	3.0	-2.0	1.5	-2.0	2.0	-2.0
0.0	1.0	-1.0	1.0	-2.0	2.5	-2.5	3.0	-2.0	0.5
-0.5	1.5	-2.0	2.0	-2.0	1.5	-1.0	1.0	-1.5	1.5
-2.0	2.0	-2.0	1.0	-1.0	1.5	-1.5	0.5	-0.5	1.5
-1.5	2.5	-1.5	-1.0	1.5	-1.5	2.0	-2.0		

AVE. VARIATION = -0.0DB STANDARD DEVIATION = 4.8

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-6.25	0.0
-5.75	0.0
-5.25	1.0
-4.75	1.0
-4.25	0.0
-3.75	0.0
-3.25	3.0
-2.75	2.0
-2.25	2.0
-1.75	15.0
-1.25	8.0
-0.75	9.0
-0.25	3.0
0.25	2.0
0.75	3.0
1.25	9.0
1.75	11.0
2.25	7.0
2.75	3.0
3.25	5.0
3.75	1.0
4.25	1.0
4.75	0.0
5.25	1.0
5.75	1.0
6.25	0.0

NEGATIVE VALUES MEAN = -1.92
POSITIVE VALUES MEAN = 1.94
NEGATIVE VARIANCE = 1.12
POSITIVE VARIANCE = 1.26
NEGATIVE STANDARD DEVIATION = 1.06
POSITIVE STANDARD DEVIATION = 1.12



X-SCALE=5.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
VARIATIONS RUN57 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.40.

VARIATIONS RUN57 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
6.00	1.000
5.50	0.989
5.00	0.966
4.50	0.955
4.00	0.943
3.50	0.932
3.00	0.841
2.50	0.784
2.00	0.682
1.50	0.386
1.00	0.193
0.50	0.057

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	298 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	018 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
.9	.0	4.874
1.7	.0	1.450
2.5	.0	1.487
3.2	.0	2.803
3.8	.0	3.345
4.3	.0	2.842
4.6	.0	2.307
4.9	.0	2.045
4.9	.0	1.976
4.9	.0	2.045
4.6	.0	2.307
4.3	.0	2.842
3.8	.0	3.345
3.2	.0	2.803
2.5	.0	1.487
1.7	.0	1.450
.9	.0	4.874
-.9	.0	5.079
-1.7	.0	1.590
-2.5	.0	1.414
-3.2	.0	2.589
-3.8	.0	3.325
-4.3	.0	3.046
-4.6	.0	2.554
-4.9	.0	2.264
-4.9	.0	2.179
-4.9	.0	2.264
-4.6	.0	2.554
-4.3	.0	3.046
-3.8	.0	3.325
-3.2	.0	2.589
-2.5	.0	1.414
-1.7	.0	1.590
-.9	.0	5.079

AVERAGE VALUE = 2.65 DB

DISTRIBUTION RUN57AROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

DATA POINTS

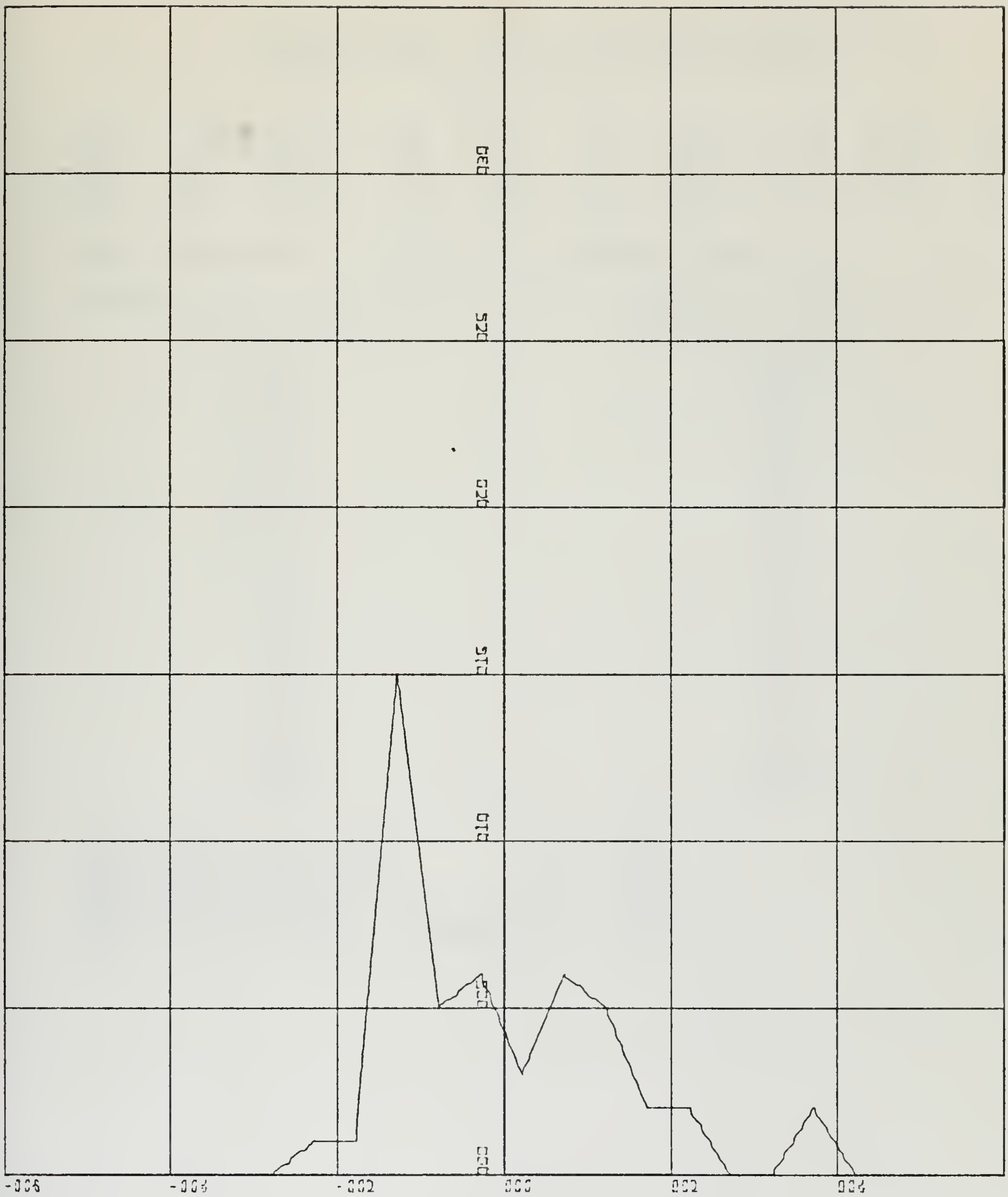
81.0	76.0	81.0	76.0	79.0	76.0	77.0	76.0	77.5
76.0	78.5	75.5	77.0	76.0	78.0	76.5	77.5	76.5
78.0	76.5	78.5	76.0	79.5	76.0	77.0	76.0	79.5
75.0	79.0	76.0	78.0	76.0	78.5	76.5	78.0	76.0
77.5	77.0	78.0	76.0	77.0	76.0	78.5	76.0	78.5
77.0	78.0	76.5						

AVERAGE POWER = 77.2DB STANDARD DEVIATION = 1.9

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-4.25	0.0
-3.75	0.0
-3.25	0.0
-2.75	0.0
-2.25	1.0
-1.75	1.0
-1.25	15.0
-0.75	5.0
-0.25	6.0
0.25	3.0
0.75	6.0
1.25	5.0
1.75	2.0
2.25	2.0
2.75	0.0
3.25	0.0
3.75	2.0
4.25	0.0

NEGATIVE VALUES MEAN = -0.98
POSITIVE VALUES MEAN = 1.37
NEGATIVE VARIANCE = 0.25
POSITIVE VARIANCE = 1.02
NEGATIVE STANDARD DEVIATION = 0.50
POSITIVE STANDARD DEVIATION = 1.01



K-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.

DISTRIBUTION RUN57AROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

VARIATIONS RUN57AROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

VARIATIONS

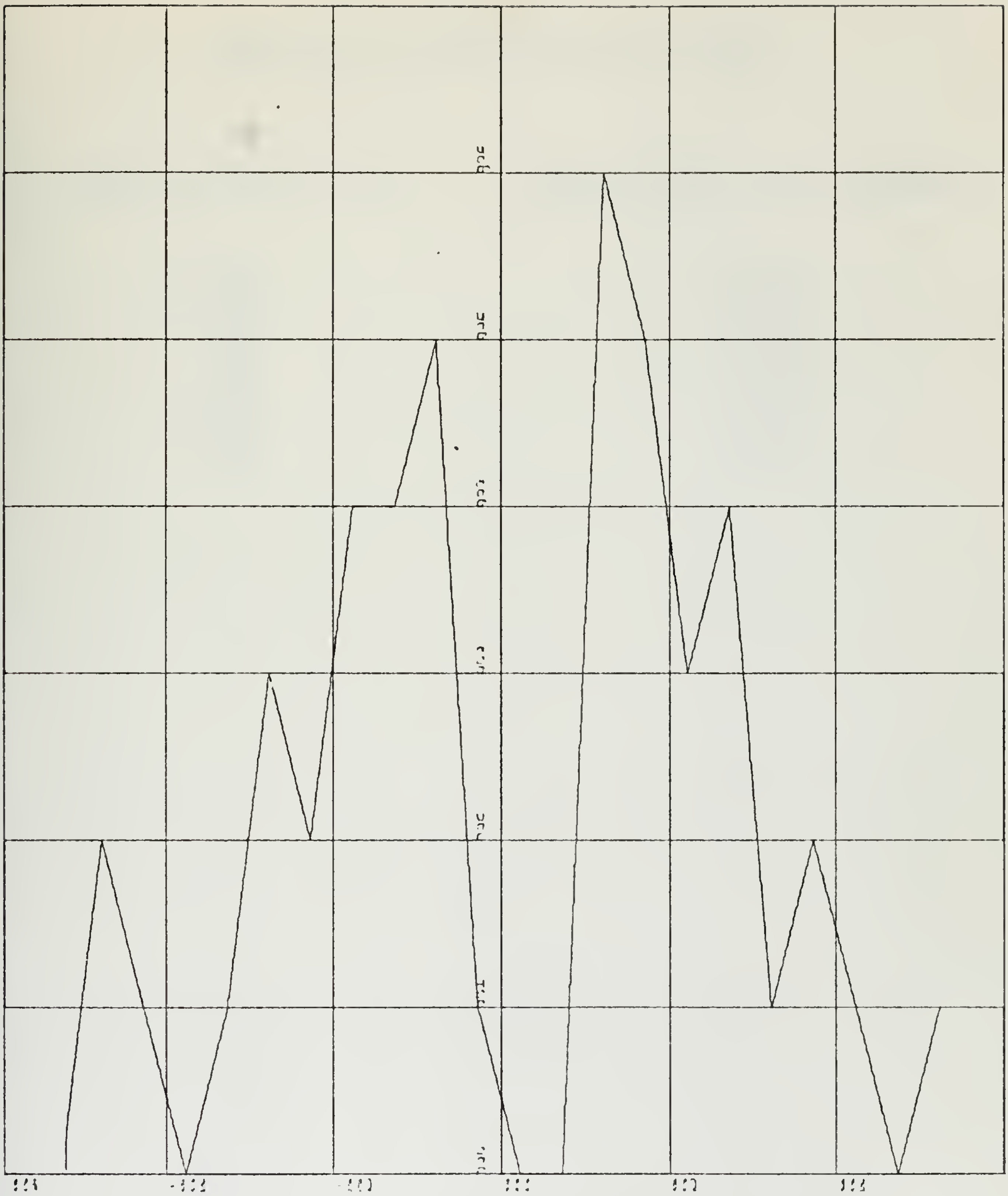
-5.0	5.0	-5.0	3.0	-3.0	1.0	-1.0	1.5	-1.5	2.5
-3.0	1.5	-1.0	2.0	-1.5	1.0	-1.0	1.5	-1.5	2.0
-2.5	3.5	-3.5	1.0	-1.0	3.5	-4.5	4.0	-3.0	2.0
-2.0	2.5	-2.0	1.5	-2.0	1.5	-0.5	1.0	-2.0	1.0
-1.0	2.5	-2.5	2.5	-1.5	1.0				

AVE. VARIATION = -0.1DB STANDARD DEVIATION = 6.2

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATICNS, DB	POINTS AT THAT VALUE
-5.25	0.0
-4.75	2.0
-4.25	1.0
-3.75	0.0
-3.25	1.0
-2.75	3.0
-2.25	2.0
-1.75	4.0
-1.25	4.0
-0.75	5.0
-0.25	1.0
0.25	0.0
0.75	0.0
1.25	6.0
1.75	5.0
2.25	3.0
2.75	4.0
3.25	1.0
3.75	2.0
4.25	1.0
4.75	0.0
5.25	1.0

NEGATIVE VALUES MEAN = -2.24
POSITIVE VALUES MEAN = 2.11
NEGATIVE VARIANCE = 1.68
POSITIVE VARIANCE = 1.20
NEGATIVE STANDARD DEVIATION = 1.30
POSITIVE STANDARD DEVIATICN = 1.10



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=1.00E+00 UNITS INCH.
VARIATIONS RUN57AROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

VARIATIONS   RUN57AROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
5.00	0.978
4.50	0.935
4.00	0.891
3.50	0.848
3.00	0.804
2.50	0.652
2.00	0.543
1.50	0.348
1.00	0.130
0.50	0.022

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	298 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	1
DIRECTION OF SEA	=	090 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
1.4	.0	2.157
2.7	.0	1.925
4.0	.0	3.204
5.1	.0	1.848
6.1	.0	2.276
6.9	.0	2.803
7.5	.0	2.532
7.9	.0	2.232
8.0	.0	2.139
7.9	.0	2.232
7.5	.0	2.532
6.9	.0	2.803
6.1	.0	2.276
5.1	.0	1.848
4.0	.0	3.204
2.7	.0	1.925
1.4	.0	2.157
-1.4	.0	2.347
-2.7	.0	1.775
-4.0	.0	3.296
-5.1	.0	1.995
-6.1	.0	2.100
-6.9	.0	2.741
-7.5	.0	2.725
-7.9	.0	2.486
-8.0	.0	2.391
-7.9	.0	2.486
-7.5	.0	2.725
-6.9	.0	2.741
-6.1	.0	2.100
-5.1	.0	1.995
-4.0	.0	3.296
-2.7	.0	1.775
-1.4	.0	2.347

AVERAGE VALUE = 2.39 DB

DISTRIBUTION RUN58 ROLL08 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

DATA POINTS

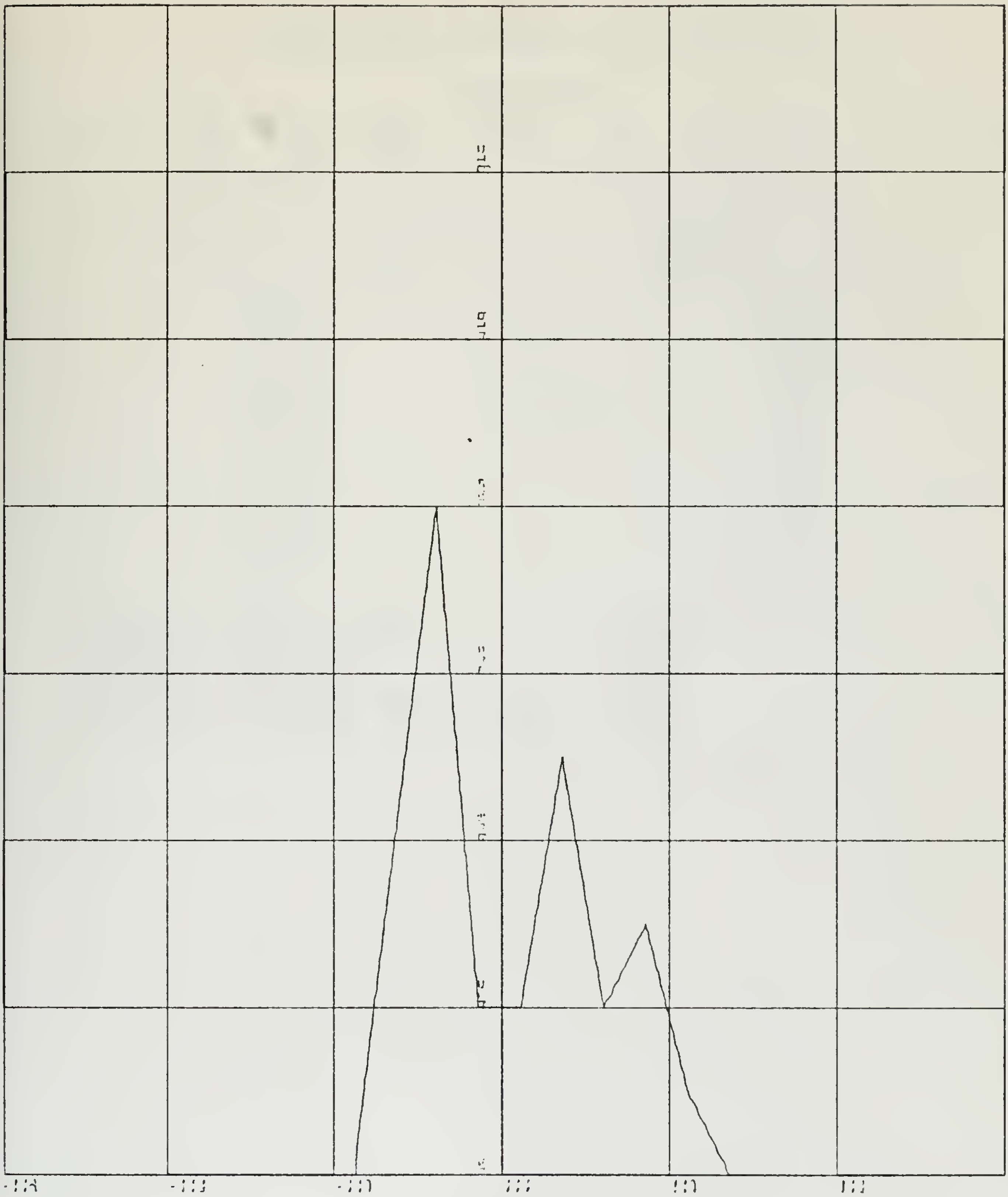
75.5	77.0	76.0	77.0	75.0	77.5	75.0	77.5	75.5
76.5	75.5	78.0	75.0	77.0	75.0	77.0	75.5	77.0
75.5	78.0	75.5	78.0	76.0	78.5	75.5	76.5	75.5

AVERAGE POWER = 76.4DB STANDARD DEVIATION = 1.2

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-3.25	0.0
-2.75	0.0
-2.25	0.0
-1.75	0.0
-1.25	4.0
-0.75	8.0
-0.25	2.0
0.25	2.0
0.75	5.0
1.25	2.0
1.75	3.0
2.25	1.0
2.75	0.0
3.25	0.0

NEGATIVE VALUES MEAN = -0.92
POSITIVE VALUES MEAN = 0.99
NEGATIVE VARIANCE = 0.11
POSITIVE VARIANCE = 0.39
NEGATIVE STANDARD DEVIATION = 0.33
POSITIVE STANDARD DEVIATION = 0.63



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DISTRIBUTION RUN58 ROLL08 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

VARIATIONS RUN58 ROLL08 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

VARIATIONS

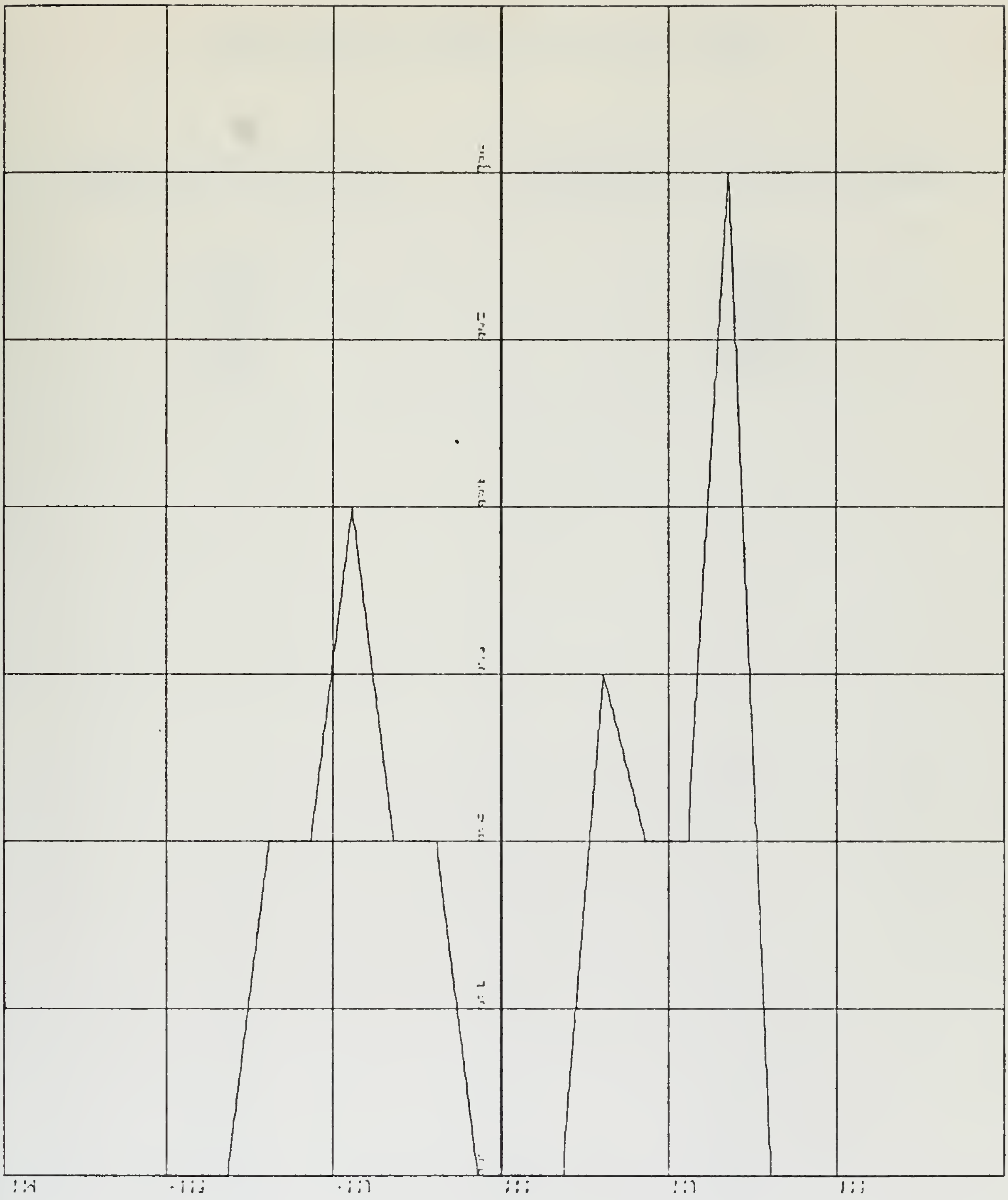
1.5	-1.0	1.0	-2.0	2.5	-2.5	2.5	-2.0	1.0	-1.0
2.5	-3.0	2.0	-2.0	2.0	-1.5	1.5	-1.5	2.5	-2.5
2.5	-2.0	2.5	-3.0	1.0					

AVE. VARIATION = 0.0DB STANDARD DEVIATION = 4.4

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-3.25	0.0
-2.75	2.0
-2.25	2.0
-1.75	4.0
-1.25	2.0
-0.75	2.0
-0.25	0.0
0.25	0.0
0.75	0.0
1.25	3.0
1.75	2.0
2.25	2.0
2.75	6.0
3.25	0.0

NEGATIVE VALUES MEAN = -2.00
POSITIVE VALUES MEAN = 1.92
NEGATIVE VARIANCE = 0.45
POSITIVE VARIANCE = 0.41
NEGATIVE STANDARD DEVIATION = 0.67
POSITIVE STANDARD DEVIATION = 0.64



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Y-SCALE=1.00E+00 UNITS INCH.
VARIATIONS RUN58 ROLL08 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.40

VARIATIONS RUN58 ROLL08 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
3.00	1.000
2.50	0.680
2.00	0.520
1.50	0.280
1.00	0.080
0.50	0.0

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	298 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	018 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
.9	.0	4.874
1.7	.0	1.450
2.5	.0	1.487
3.2	.0	2.803
3.8	.0	3.345
4.3	.0	2.842
4.6	.0	2.307
4.9	.0	2.045
4.9	.0	1.976
4.9	.0	2.045
4.6	.0	2.307
4.3	.0	2.842
3.8	.0	3.345
3.2	.0	2.803
2.5	.0	1.487
1.7	.0	1.450
.9	.0	4.874
-.9	.0	5.079
-1.7	.0	1.590
-2.5	.0	1.414
-3.2	.0	2.589
-3.8	.0	3.325
-4.3	.0	3.046
-4.6	.0	2.554
-4.9	.0	2.264
-4.9	.0	2.179
-4.9	.0	2.264
-4.6	.0	2.554
-4.3	.0	3.046
-3.8	.0	3.325
-3.2	.0	2.589
-2.5	.0	1.414
-1.7	.0	1.590
-.9	.0	5.079

AVERAGE VALUE = 2.65 DB

DISTRIBUTION RUN59 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

DATA POINTS

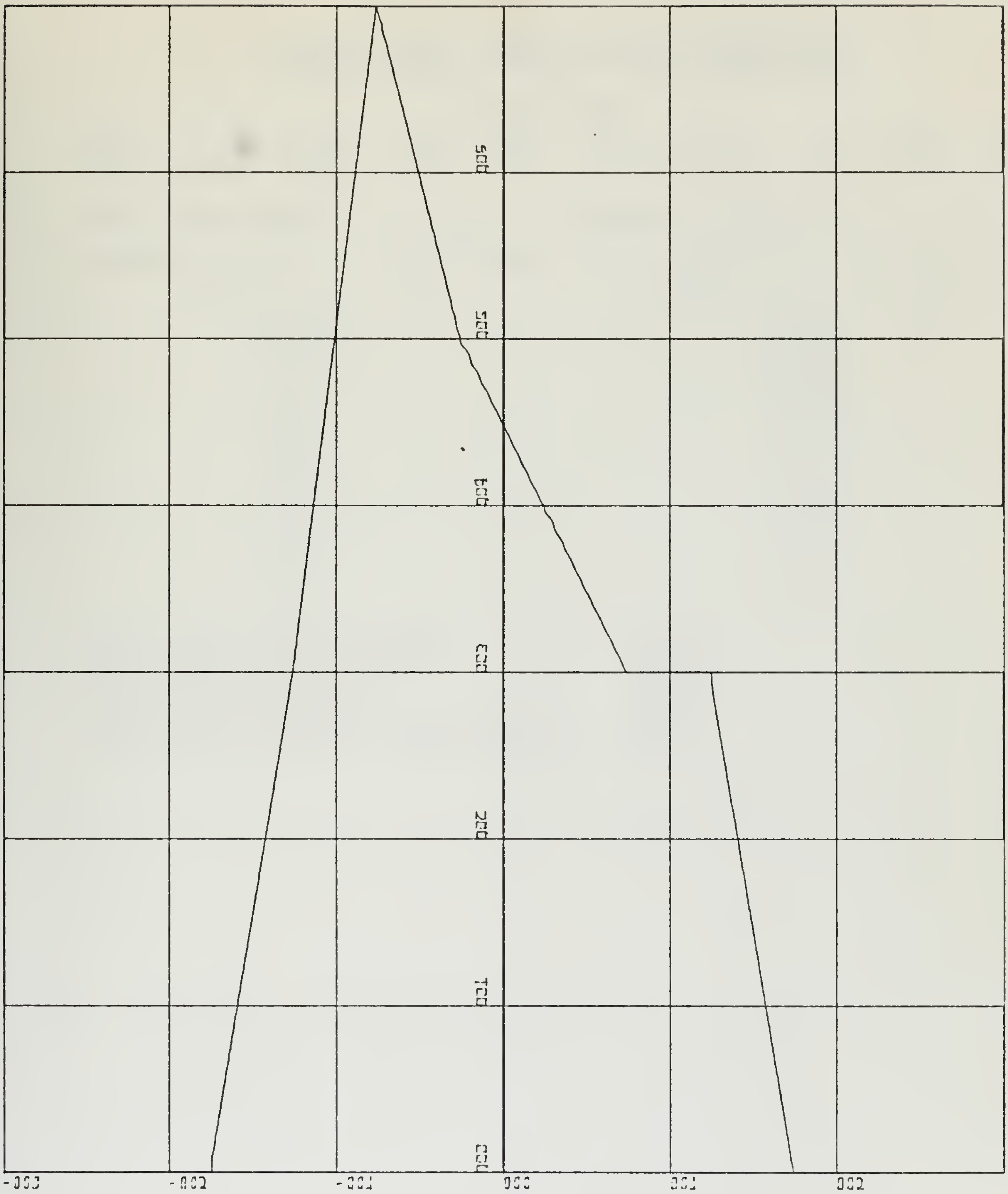
76.5	74.5	77.0	74.5	76.5	75.0	75.5	75.0	75.5
75.0	76.0	74.5	76.0	75.5	76.0	75.0	75.5	75.0
76.5	76.0	75.0	77.0	75.0	77.0	75.5		

AVERAGE POWER = 75.6DB STANDARD DEVIATION = 0.6

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-2.25	0.0
-1.75	0.0
-1.25	3.0
-0.75	7.0
-0.25	5.0
0.25	4.0
0.75	3.0
1.25	3.0
1.75	0.0
2.25	0.0

NEGATIVE VALUES MEAN = -0.55
POSITIVE VALUES MEAN = 0.83
NEGATIVE VARIANCE = 0.14
POSITIVE VARIANCE = 0.19
NEGATIVE STANDARD DEVIATION = 0.37
POSITIVE STANDARD DEVIATION = 0.44



X-SCALE=1.00E+00 UNITS INCH.
Y-SCALE=1.00E+00 UNITS INCH.
DISTRIBUTION RUN59 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

VARIATIONS RUN59 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

VARIATIONS

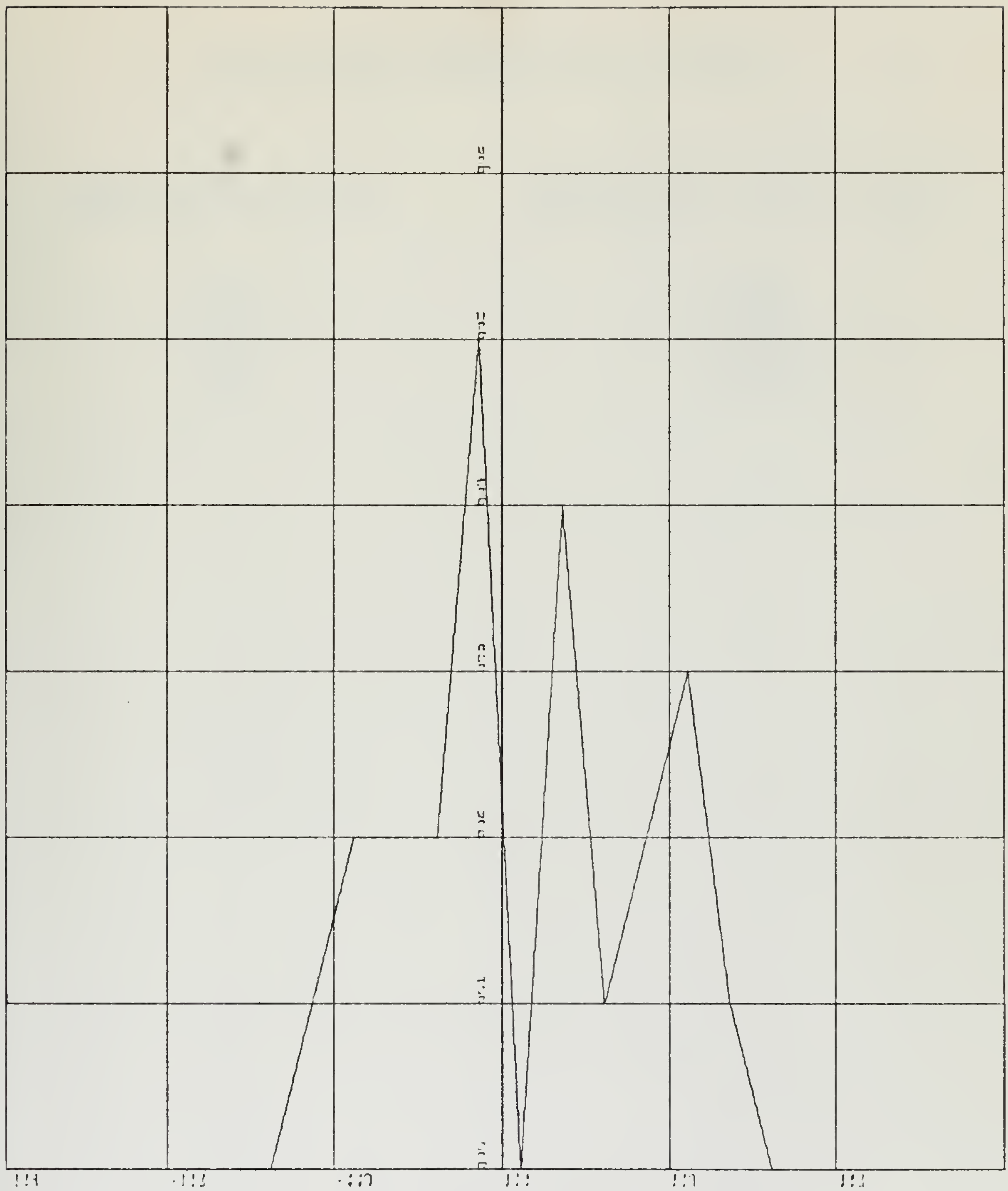
-2.0	2.5	-2.5	2.0	-1.5	0.5	-0.5	0.5	-0.5	1.0
-1.5	1.5	-0.5	0.5	-1.0	0.5	-0.5	1.5	-0.5	-1.0
2.0	-2.0	2.0							

AVE. VARIATION = 0.0DB STANDARD DEVIATION = 2.1

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-3.25	0.0
-2.75	0.0
-2.25	1.0
-1.75	2.0
-1.25	2.0
-0.75	2.0
-0.25	5.0
0.25	0.0
0.75	4.0
1.25	1.0
1.75	2.0
2.25	3.0
2.75	1.0
3.25	0.0

NEGATIVE VALUES MEAN = -1.17
POSITIVE VALUES MEAN = 1.32
NEGATIVE VARIANCE = 0.52
POSITIVE VARIANCE = 0.56
NEGATIVE STANDARD DEVIATION = 0.72
POSITIVE STANDARD DEVIATION = 0.75



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=1.00E+00 UNITS INCH.
VARIATIONS RUN59 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

VARIATIONS RUN59 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
3.00	1.000
2.50	0.957
2.00	0.783
1.50	0.609
1.00	0.478
0.50	0.217

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	208 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	030 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
1.M	.8	2.162
2.7	1.6	1.939
4.0	2.4	3.240
5.1	3.1	1.903
6.1	3.7	2.335
6.9	4.2	2.892
7.5	4.5	2.657
7.9	4.7	2.369
8.0	4.8	2.279
7.9	4.7	2.369
7.5	4.5	2.657
6.9	4.2	2.892
6.1	3.7	2.335
5.1	3.1	1.903
4.0	2.4	3.240
2.7	1.6	1.939
1.4	.8	2.162
-1.4	-.8	2.350
-2.7	-1.6	1.784
-4.0	-2.4	3.322
-5.1	-3.1	2.042
-6.1	-3.7	2.148
-6.9	-4.2	2.808
-7.5	-4.5	2.827
-7.9	-4.7	2.607
-8.0	-4.8	2.517
-7.9	-4.7	2.607
-7.5	-4.5	2.827
-6.9	-4.2	2.808
-6.1	-3.7	2.148
-5.1	-3.1	2.042
-4.0	-2.4	3.322
-2.7	-1.6	1.784
-1.4	-.8	2.350

AVERAGE VALUE = 2.46 DB

DISTRIBUTION RUN60 ROLL08 PITCH06
COURSE 000 E&M DIR. 152 DIST 7.48

DATA POINTS

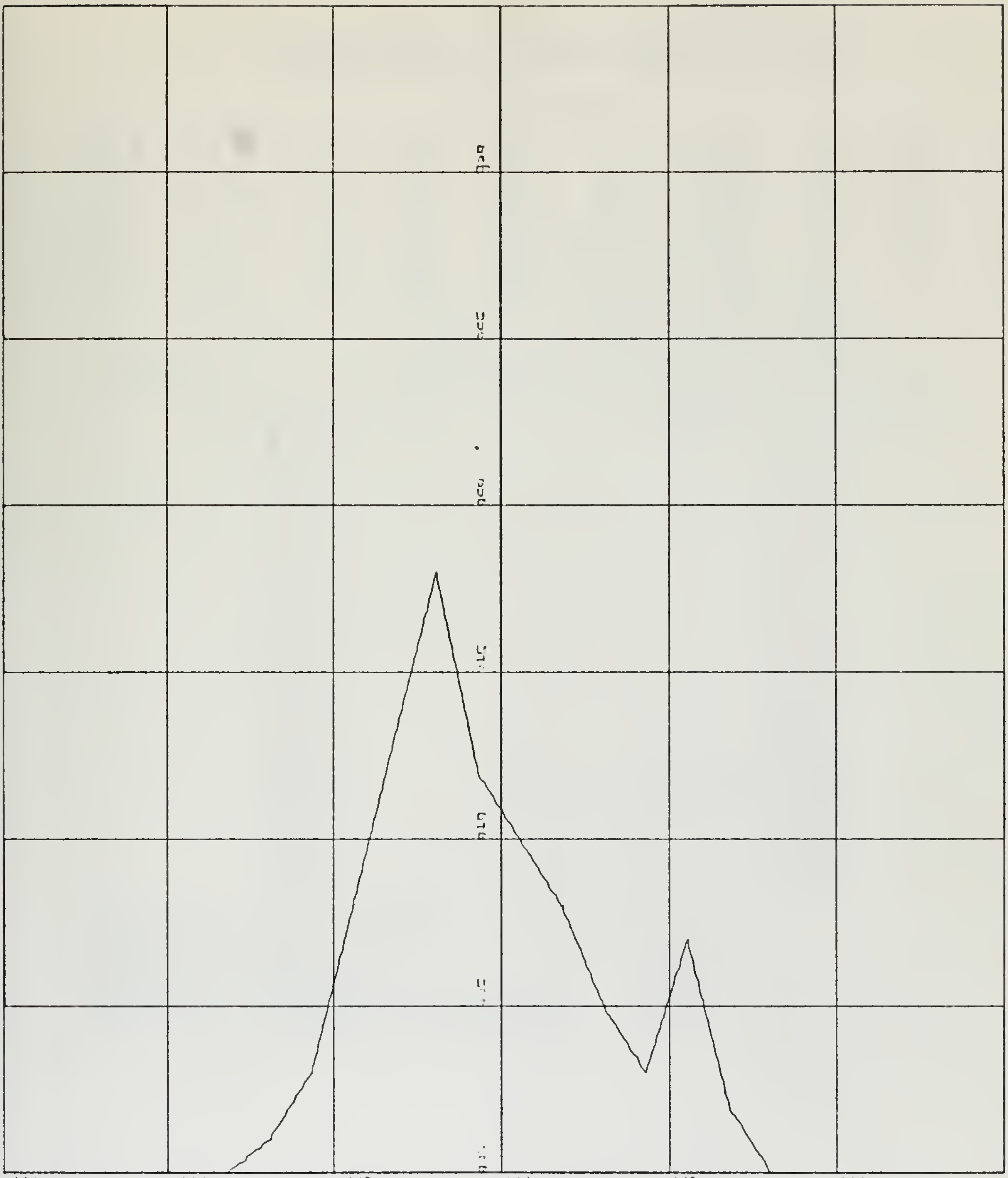
77.5	76.5	77.0	75.5	79.0	76.0	78.0	76.5	79.0
76.0	78.5	76.0	79.0	76.0	78.5	76.0	79.0	76.0
77.5	75.0	79.5	76.0	77.5	75.5	79.0	76.0	78.0
75.0	79.5	76.5	78.0	75.5	77.0	76.0	79.0	75.0
78.0	75.0	76.5	76.0	77.5	79.0	75.5	77.5	76.0
76.5	77.0	75.5	77.5	75.5	77.0	76.0	77.0	75.5
78.5	76.0	77.0	75.5	76.5	75.5	76.5	75.0	76.5
75.5	77.0	78.0	76.0	75.5	77.0	76.0	76.5	75.0
76.5	76.5	76.0	77.5	75.5	77.0	75.5	77.0	74.5
77.5	75.0	76.0	74.5	76.0	74.5	76.5	74.0	75.0

AVERAGE POWER = 76.6DB STANDARD DEVIATION = 1.7

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-3.25	0.0
-2.75	1.0
-2.25	3.0
-1.75	8.0
-1.25	13.0
-0.75	18.0
-0.25	12.0
0.25	10.0
0.75	8.0
1.25	5.0
1.75	3.0
2.25	7.0
2.75	2.0
3.25	0.0

NEGATIVE VALUES MEAN = -0.86
POSITIVE VALUES MEAN = 1.35
NEGATIVE VARIANCE = 0.39
POSITIVE VARIANCE = 0.71
NEGATIVE STANDARD DEVIATICN = 0.62
POSITIVE STANDARD DEVIATION = 0.84



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
DISTRIBUTION RUN60 ROLL08 PITCH06
COURSE 000 E&M DIR. 152 DIST 7.40

VARIATIONS RUN60 ROLL08 PITCH06
COURSE 000 E&M DIR. 152 DIST 7.48

VARIATIONS

-1.0	0.5	-1.5	3.5	-3.0	2.0	-1.5	2.5	-3.0	2.5
-2.5	3.0	-3.0	2.5	-2.5	3.0	-3.0	1.5	-2.5	4.5
-3.5	1.5	-2.0	3.5	-3.0	2.0	-3.0	4.5	-3.0	1.5
-2.5	1.5	-1.0	3.0	-4.0	3.0	-3.0	1.5	-0.5	1.5
1.5	-3.5	2.0	-1.5	0.5	0.5	-1.5	2.0	-2.0	1.5
-1.0	1.0	-1.5	3.0	-2.5	1.0	-1.5	1.0	-1.0	1.0
-1.5	1.5	-1.0	1.5	1.0	-2.0	-0.5	1.5	-1.0	0.5
-1.5	1.5	0.0	-0.5	1.5	-2.0	1.5	-1.5	1.5	-2.5
3.0	-2.5	1.0	-1.5	1.5	-1.5	2.0	-2.5		

AVE. VARIATION = -0.0DB STANDARD DEVIATION = 4.7

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-5.25	0.0
-4.75	0.0
-4.25	0.0
-3.75	1.0
-3.25	2.0
-2.75	8.0
-2.25	8.0
-1.75	4.0
-1.25	11.0
-0.75	6.0
-0.25	3.0
0.25	1.0
0.75	4.0
1.25	6.0
1.75	16.0
2.25	5.0
2.75	3.0
3.25	6.0
3.75	2.0
4.25	0.0
4.75	2.0
5.25	0.0

NEGATIVE VALUES MEAN = -2.02
POSITIVE VALUES MEAN = 1.90
NEGATIVE VARIANCE = 0.81
POSITIVE VARIANCE = 0.98
NEGATIVE STANDARD DEVIATION = 0.90
POSITIVE STANDARD DEVIATION = 0.99

X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
VARIATIONS RUN60 ROLL08 PITCH06
COURSE 000 E&M DIR. 152 DIST 7.40

VARIATIONS RUN60 ROLL08 PITCH06
COURSE 000 E&M DIR. 152 DIST 7.48

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
5.00	1.000
4.50	0.977
4.00	0.977
3.50	0.943
3.00	0.852
2.50	0.727
2.00	0.580
1.50	0.352
1.00	0.159
0.50	0.045

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	298 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	018 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
.9	.0	4.874
1.7	.0	1.450
2.5	.0	1.487
3.2	.0	2.803
3.8	.0	3.345
4.3	.0	2.842
4.6	.0	2.307
4.9	.0	2.045
4.9	.0	1.976
4.9	.0	2.045
4.6	.0	2.307
4.3	.0	2.842
3.8	.0	3.345
3.2	.0	2.803
2.5	.0	1.487
1.7	.0	1.450
.9	.0	4.874
-.9	.0	5.079
-1.7	.0	1.590
-2.5	.0	1.414
-3.2	.0	2.589
-3.8	.0	3.325
-4.3	.0	3.046
-4.6	.0	2.554
-4.9	.0	2.264
-4.9	.0	2.179
-4.9	.0	2.264
-4.6	.0	2.554
-4.3	.0	3.046
-3.8	.0	3.325
-3.2	.0	2.589
-2.5	.0	1.414
-1.7	.0	1.590
-.9	.0	5.079

AVERAGE VALUE = 2.65 DB

DISTRIBUTION RUN61 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

DATA POINTS

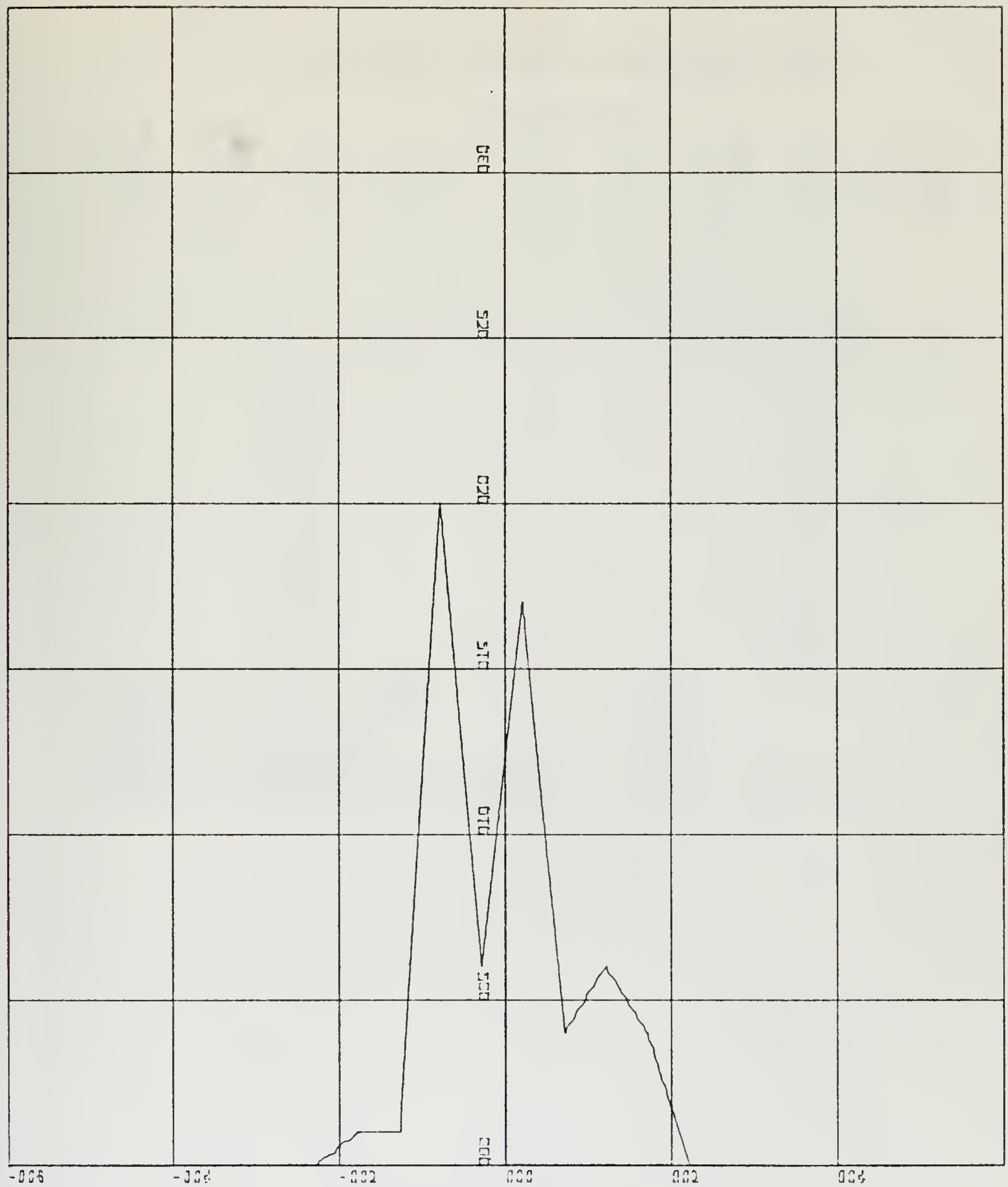
76.0	75.0	76.0	74.0	75.0	74.5	76.5	75.0	76.0
74.0	75.0	74.0	76.5	74.5	76.0	74.0	75.0	76.5
74.5	76.5	74.0	76.0	74.5	75.5	74.0	76.0	74.0
75.0	74.0	75.0	74.0	75.0	74.0	75.5	74.0	75.5
74.5	75.5	74.5	75.0	73.5	75.0	74.0	75.0	74.0
75.0	74.0	75.0	74.0	75.0	74.0	75.0	74.0	75.0
74.0	75.0	74.0	73.0	74.0				

AVERAGE POWER = 74.8DB STANDARD DEVIATION = 0.7

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-2.25	0.0
-1.75	1.0
-1.25	1.0
-0.75	20.0
-0.25	6.0
0.25	17.0
0.75	4.0
1.25	6.0
1.75	4.0
2.25	0.0

NEGATIVE VALUES MEAN = -0.73
POSITIVE VALUES MEAN = 0.66
NEGATIVE VARIANCE = 0.10
POSITIVE VARIANCE = 0.32
NEGATIVE STANDARD DEVIATION = 0.31
POSITIVE STANDARD DEVIATION = 0.57



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.

DISTRIBUTION RUN61 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

VARIATIONS RUN61 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

VARIATIONS

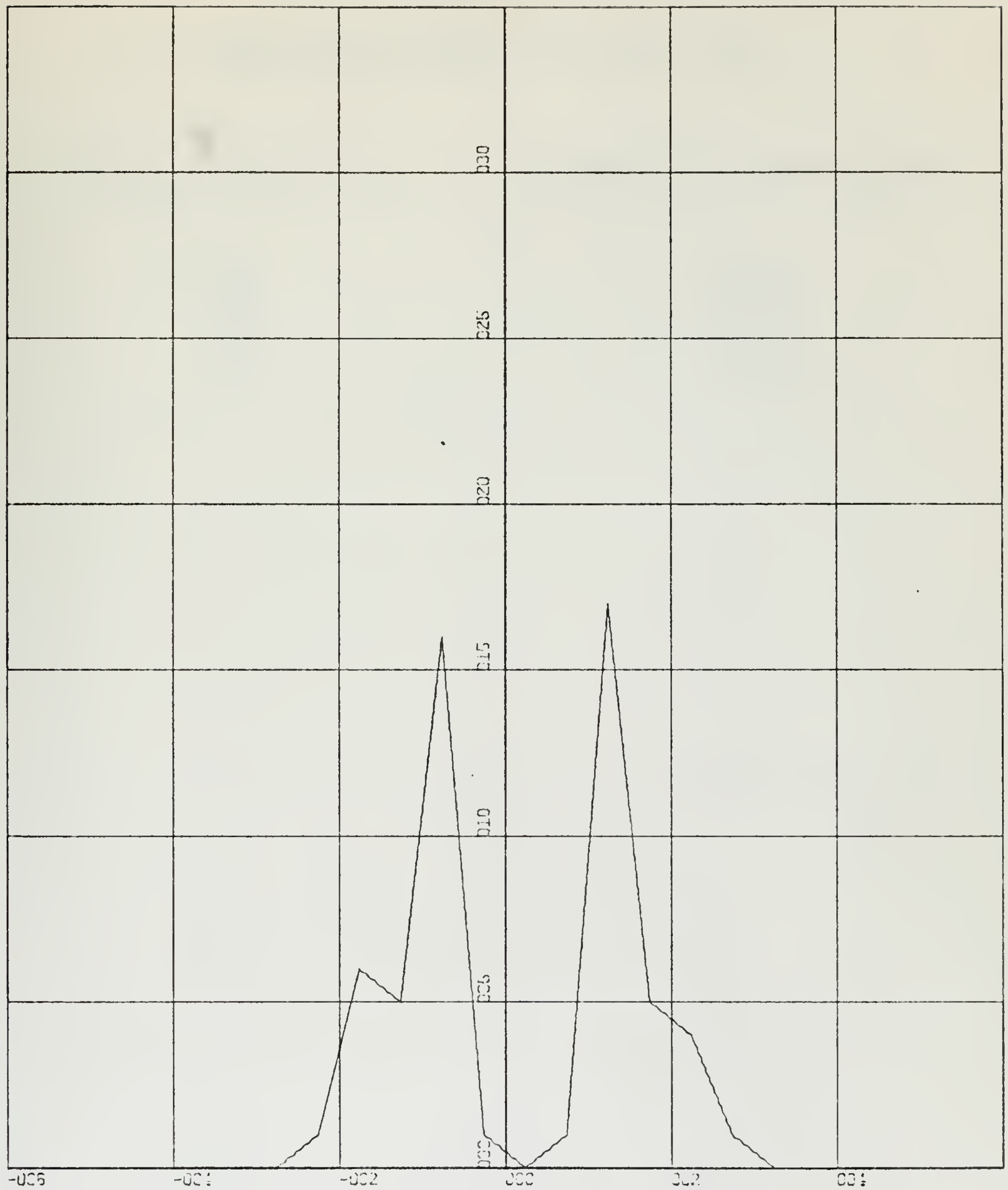
-1.0	1.0	-2.0	1.0	-0.5	2.0	-1.5	1.0	-2.0	1.0
-1.0	2.5	-2.0	1.5	-2.0	1.0	1.5	-2.0	2.0	-2.5
2.0	-1.5	1.0	-1.5	2.0	-2.0	1.0	-1.0	1.0	-1.0
1.0	-1.0	1.5	-1.5	1.5	-1.0	1.0	-1.0	0.5	-1.5
1.5	-1.0	1.0	-1.0	1.0	-1.0	1.0	-1.0	1.0	-1.0
1.0	-1.0	1.0	-1.0	1.0	-1.0	-1.0			

AVE. VARIATION = -0.1DB STANDARD DEVIATION = 1.9

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-3.25	0.0
-2.75	0.0
-2.25	1.0
-1.75	6.0
-1.25	5.0
-0.75	16.0
-0.25	1.0
0.25	0.0
0.75	1.0
1.25	17.0
1.75	5.0
2.25	4.0
2.75	1.0
3.25	0.0

NEGATIVE VALUES MEAN = -1.33
POSITIVE VALUES MEAN = 1.27
NEGATIVE VARIANCE = 0.24
POSITIVE VARIANCE = 0.21
NEGATIVE STANDARD DEVIATION = 0.49
POSITIVE STANDARD DEVIATION = 0.46



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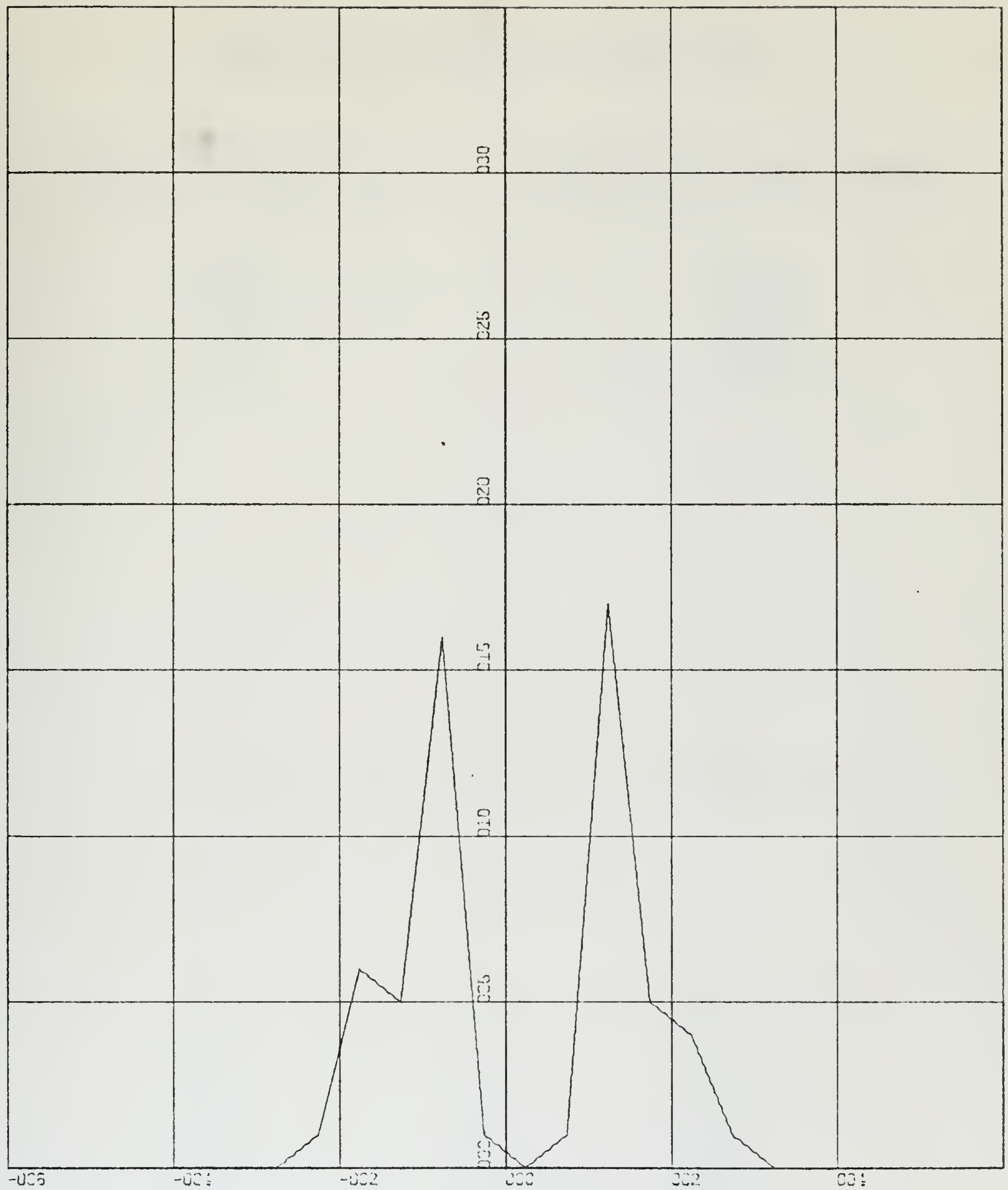
Y-SCALE=5.00E+00 UNITS INCH.
VARIATIONS RUN61 RØLL05 PITCH00
CØURSE 090 E&M DIR. 152 DIST 7.48



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
VARIATIONS RUN61 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

VARIATIONS RUN61 ROLL05 PITCH00
COURSE 090 E&M DIR. 152 DIST 7.48

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
3.00	1.000
2.50	0.982
2.00	0.895
1.50	0.702
1.00	0.316
0.50	0.018

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	010 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	070 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
2.6	.0	1.727
5.1	.0	1.940
7.5	.0	2.718
9.7	.0	2.638
11.5	.0	2.355
13.0	.0	2.634
14.1	.0	2.719
14.8	.0	2.504
15.0	.0	2.448
14.8	.0	2.504
14.1	.0	2.719
13.0	.0	2.634
11.5	.0	2.355
9.7	.0	2.638
7.5	.0	2.718
5.1	.0	1.940
2.6	.0	1.727
-2.6	.0	1.598
-5.1	.0	2.060
-7.5	.0	2.873
-9.7	.0	2.415
-11.5	.0	2.538
-13.0	.0	2.424
-14.1	.0	2.766
-14.8	.0	2.685
-15.0	.0	2.618
-14.8	.0	2.685
-14.1	.0	2.766
-13.0	.0	2.424
-11.5	.0	2.538
-9.7	.0	2.415
-7.5	.0	2.873
-5.1	.0	2.060
-2.6	.0	1.598

AVERAGE VALUE = 2.42 DB

DISTRIBUTION RUN62 ROLL15 PITCH00
COURSE 160 E&M DIR. 150 DIST 6.30

DATA POINTS

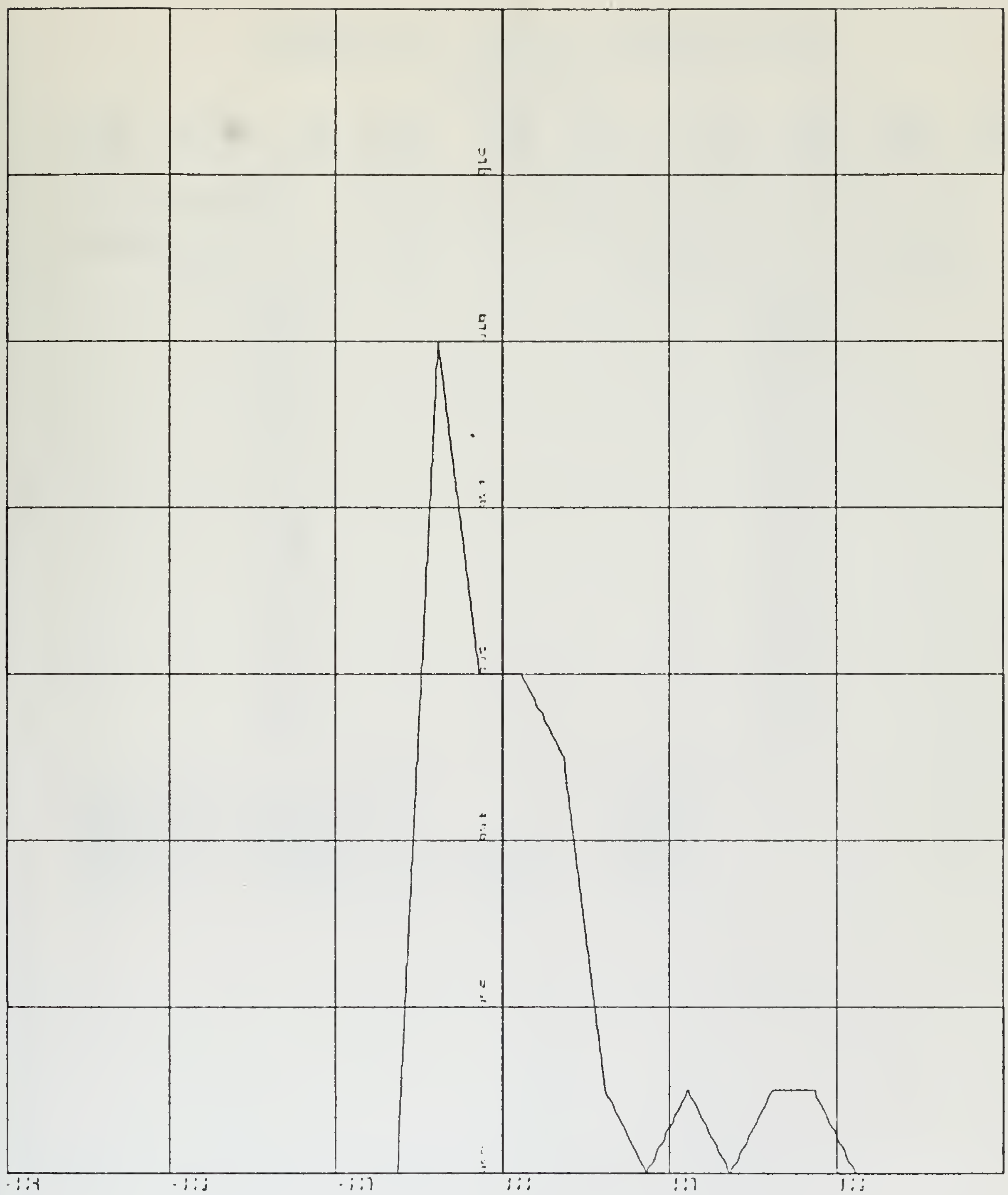
74.5	75.5	73.5	75.0	73.5	74.0	75.0	73.5	74.5
73.5	74.0	74.5	74.0	74.5	73.5	75.0	73.5	74.0
73.5	74.5	73.5	75.0	73.5	77.5	76.5	78.0	73.5
75.0	74.0	74.5	74.0					

AVERAGE POWER = 74.5DB   STANDARD DEVIATION = 1.3

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-4.25	0.0
-3.75	0.0
-3.25	0.0
-2.75	0.0
-2.25	0.0
-1.75	0.0
-1.25	0.0
-0.75	10.0
-0.25	6.0
0.25	6.0
0.75	5.0
1.25	1.0
1.75	0.0
2.25	1.0
2.75	0.0
3.25	1.0
3.75	1.0
4.25	0.0

NEGATIVE VALUES MEAN = -0.78
POSITIVE VALUES MEAN = 0.83
NEGATIVE VARIANCE = 0.06
POSITIVE VARIANCE = 1.28
NEGATIVE STANDARD DEVIATION = 0.25
POSITIVE STANDARD DEVIATION = 1.13



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=2.00E+00 UNITS INCH.
DISTRIBUTION RUN62 ROLL15 PITCH00
COURSE 160 E&M DIR. 150 DIST 6.30

VARIATIONS RUN62 ROLL15 PITCH00
COURSE 160 E&M DIR. 150 DIST 6.30

VARIATIONS

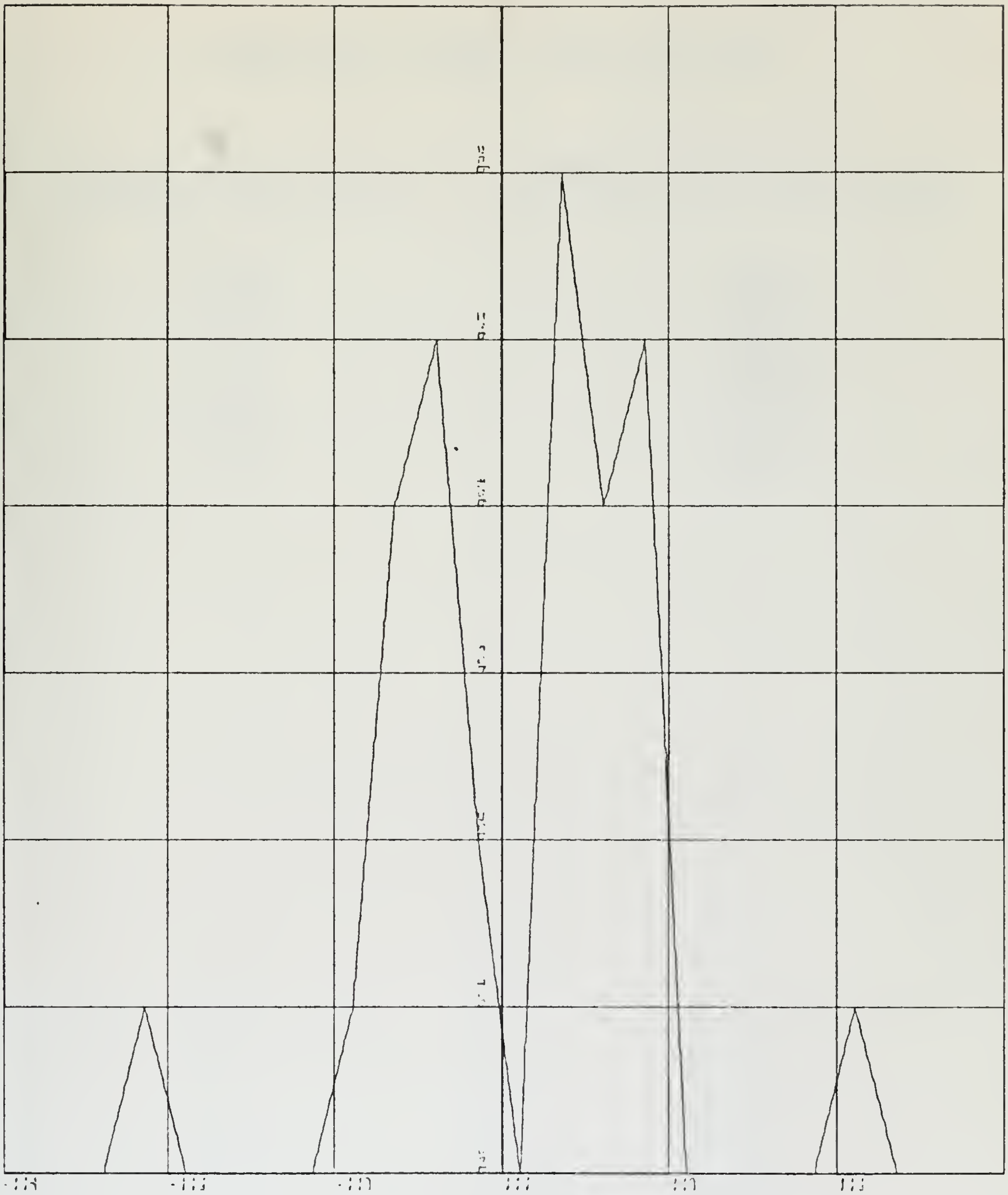
1.0	-2.0	1.5	-1.5	0.5	1.0	-1.5	1.0	-1.0	0.5
0.5	-0.5	0.5	-1.0	1.5	-1.5	0.5	-0.5	1.0	-1.0
1.5	-1.5	4.0	-1.0	1.5	-4.5	1.5	-1.0	0.5	

AVE. VARIATION = -0.0DB STANDARD DEVIATION = 2.6

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-5.25	0.0
-4.75	0.0
-4.25	1.0
-3.75	0.0
-3.25	0.0
-2.75	0.0
-2.25	0.0
-1.75	1.0
-1.25	4.0
-0.75	5.0
-0.25	2.0
0.25	0.0
0.75	6.0
1.25	4.0
1.75	5.0
2.25	0.0
2.75	0.0
3.25	0.0
3.75	0.0
4.25	1.0
4.75	0.0
5.25	0.0

NEGATIVE VALUES MEAN = -1.42
POSITIVE VALUES MEAN = 1.16
NEGATIVE VARIANCE = 1.04
POSITIVE VARIANCE = 0.76
NEGATIVE STANDARD DEVIATION = 1.02
POSITIVE STANDARD DEVIATION = 0.87



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=1.00E+00 UNITS INCH.
VARIATIONS RUN52 ROLL15 PITCH00
COURSE 160 E&M DIR. 150 DIST 6.30

VARIATIONS RUN62 ROLL15 PITCH00
COURSE 160 E&M DIR. 150 DIST 6.30

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
5.00	1.000
4.50	1.000
4.00	0.931
3.50	0.931
3.00	0.931
2.50	0.931
2.00	0.931
1.50	0.724
1.00	0.448
0.50	0.069

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	306 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	018 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
.9	.0	4.875
1.7	.0	1.452
2.5	.0	1.490
3.2	.0	2.809
3.8	.0	3.353
4.3	.0	2.852
4.6	.0	2.319
4.9	.0	2.058
4.9	.0	1.989
4.9	.0	2.058
4.6	.0	2.319
4.3	.0	2.852
3.8	.0	3.353
3.2	.0	2.809
2.5	.0	1.490
1.7	.0	1.452
.9	.0	4.875
-.9	.0	5.080
-1.7	.0	1.592
-2.5	.0	1.416
-3.2	.0	2.594
-3.8	.0	3.332
-4.3	.0	3.054
-4.6	.0	2.564
-4.9	.0	2.275
-4.9	.0	2.190
-4.9	.0	2.275
-4.6	.0	2.564
-4.3	.0	3.054
-3.8	.0	3.332
-3.2	.0	2.594
-2.5	.0	1.416
-1.7	.0	1.592
-.9	.0	5.080

AVERAGE VALUE = 2.66 DB

DISTRIBUTION RUN66 ROLL05 PITCH00
COURSE 090 E&M DIR. 144 DIST 4.17

DATA POINTS

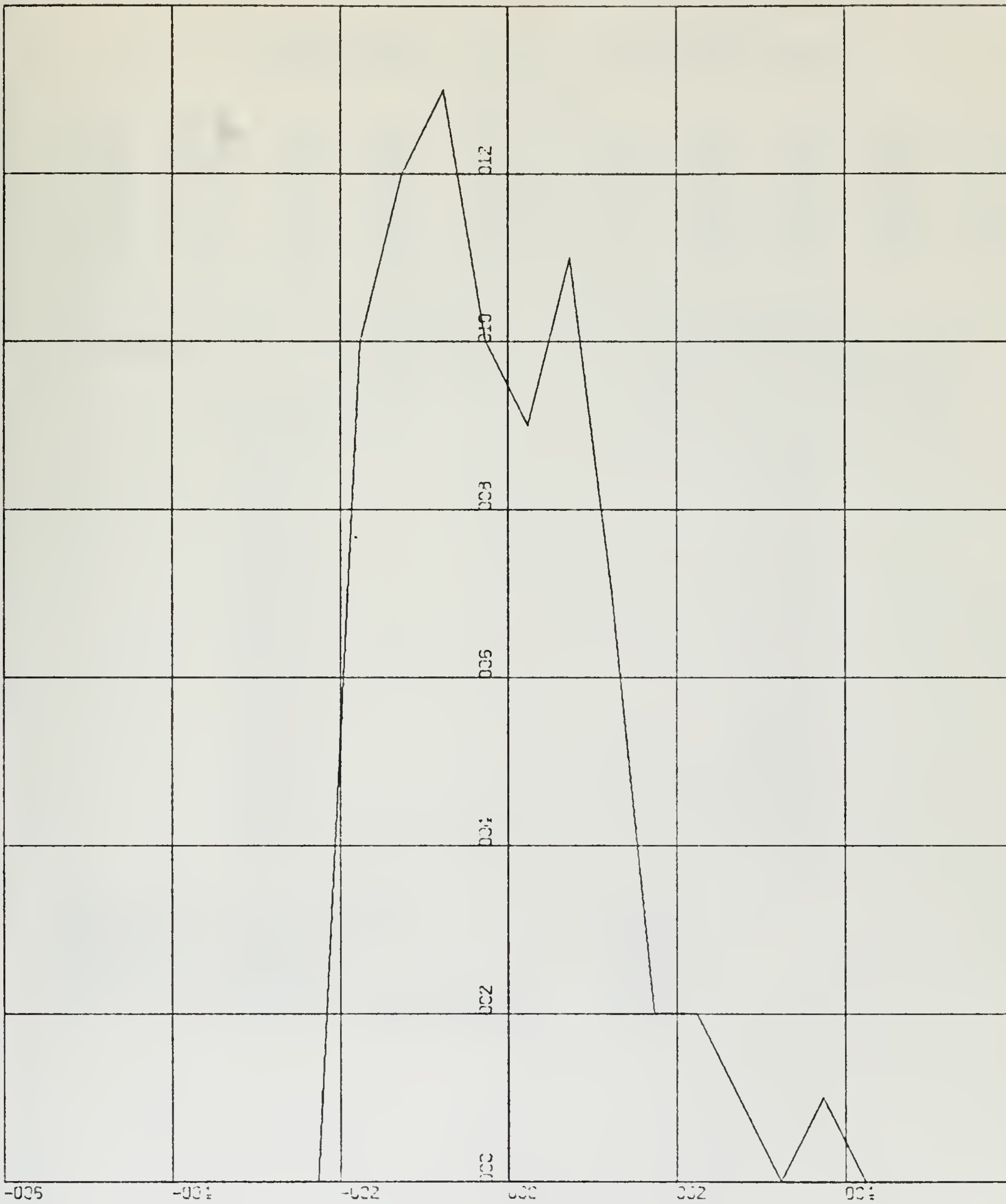
72.5	73.5	73.0	73.5	73.0	77.5	73.5	74.0	72.5
72.0	74.0	74.5	72.0	75.0	72.5	74.5	72.5	75.0
72.5	74.5	72.5	74.0	72.0	74.5	72.0	74.0	72.0
75.0	72.5	74.0	72.5	74.5	73.0	75.0	72.0	75.0
72.0	73.5	72.0	74.5	73.5	74.5	73.0	73.5	73.0
75.5	72.0	76.0	73.0	76.5	72.5	73.5	72.5	73.5
72.5	74.5	73.0	74.0	72.5	73.0	72.0	74.0	73.0
74.5	73.0	75.0	73.0	74.5	73.5	74.0	73.5	74.0
73.0	75.0	73.0	75.5	74.5	76.0			

AVERAGE POWER = 73.6DB STANDARD DEVIATION = 1.4

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-4.25	0.0
-3.75	0.0
-3.25	0.0
-2.75	0.0
-2.25	0.0
-1.75	10.0
-1.25	12.0
-0.75	13.0
-0.25	10.0
0.25	9.0
0.75	11.0
1.25	7.0
1.75	2.0
2.25	2.0
2.75	1.0
3.25	0.0
3.75	1.0
4.25	0.0

NEGATIVE VALUES MEAN = -0.85
POSITIVE VALUES MEAN = 1.16
NEGATIVE VARIANCE = 0.29
POSITIVE VARIANCE = 0.66
NEGATIVE STANDARD DEVIATION = 0.54
POSITIVE STANDARD DEVIATION = 0.81



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=2.00E+00 UNITS INCH.
DISTRIBUTION RUN66 ROLL05 PITCH00
COURSE 090 E&M DIR. 144 DIST 4.17

VARIATIONS RUN66 ROLL05 PITCH00
COURSE 090 E&M DIR. 144 DIST 4.17

VARIATIONS

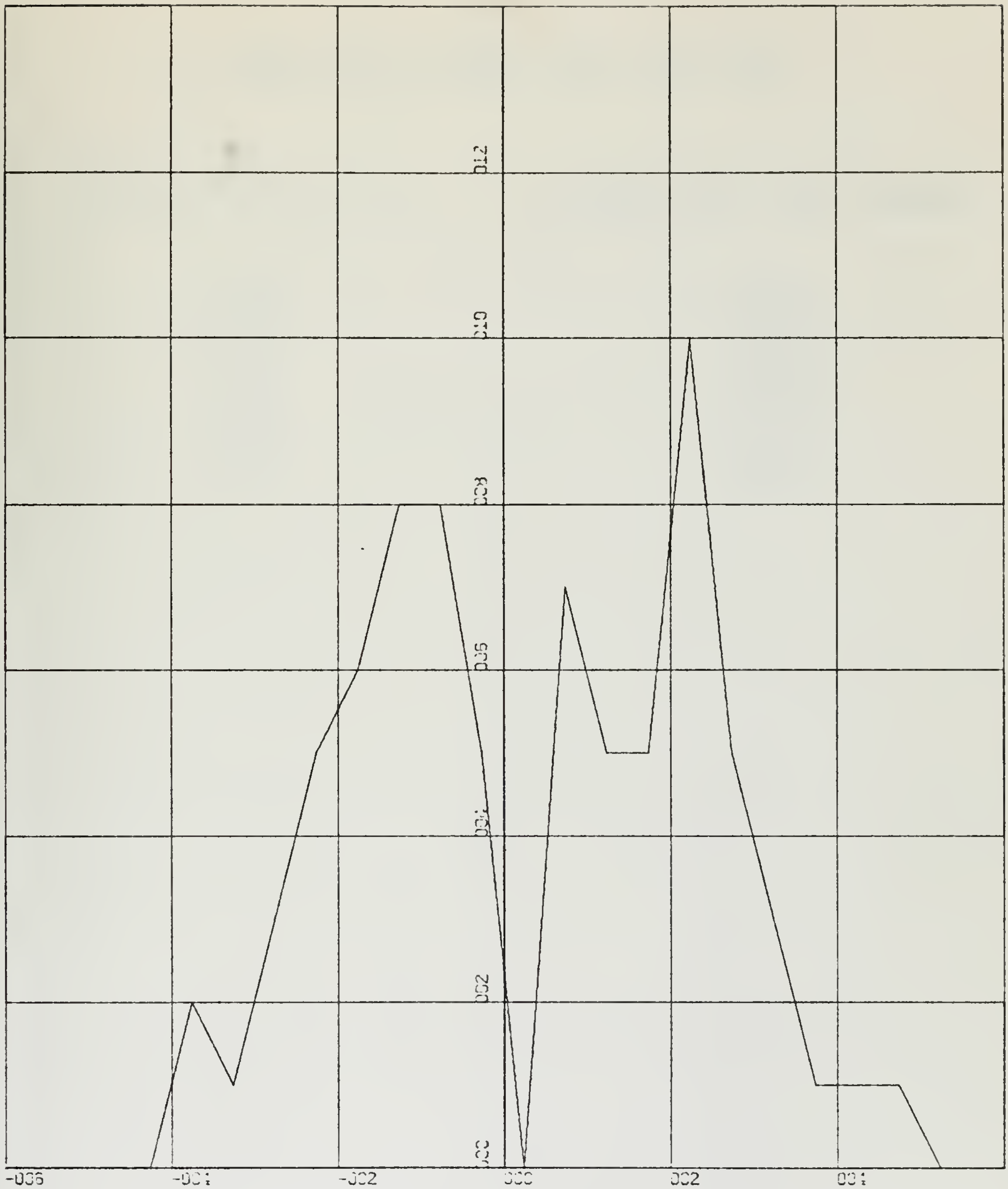
1.0	-0.5	0.5	-0.5	4.5	-4.0	0.5	-1.5	-0.5	2.0
0.5	-2.5	3.0	-2.5	2.0	-2.0	2.5	-2.5	2.0	-2.0
1.5	-2.0	2.5	-2.5	2.0	-2.0	3.0	-2.5	1.5	-1.5
2.0	-1.5	2.0	-3.0	3.0	-3.0	1.5	-1.5	2.5	-1.0
1.0	-1.5	0.5	-0.5	2.5	-3.5	4.0	-3.0	3.5	-4.0
1.0	-1.0	1.0	-1.0	2.0	-1.5	1.0	-1.5	0.5	-1.0
2.0	-1.0	1.5	-1.5	2.0	-2.0	1.5	-1.0	0.5	-0.5
0.5	-1.0	2.0	-2.0	2.5	-1.0				

AVE. VARIATION = 0.0DB STANDARD DEVIATION = 4.2

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-5.25	0.0
-4.75	0.0
-4.25	0.0
-3.75	2.0
-3.25	1.0
-2.75	3.0
-2.25	5.0
-1.75	6.0
-1.25	8.0
-0.75	8.0
-0.25	5.0
0.25	0.0
0.75	7.0
1.25	5.0
1.75	5.0
2.25	10.0
2.75	5.0
3.25	3.0
3.75	1.0
4.25	1.0
4.75	1.0
5.25	0.0

NEGATIVE VALUES MEAN = -1.78
POSITIVE VALUES MEAN = 1.83
NEGATIVE VARIANCE = 0.91
POSITIVE VARIANCE = 1.02
NEGATIVE STANDARD DEVIATICN = 0.96
POSITIVE STANDARD DEVIATICN = 1.01



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Y-SCALE=2.00E+00 UNITS INCH.
VARIATIØNS RUN66 RØLL05 PITCH00
CØURSE 090 E&M DIR. 144 DIST 4.17

VARIATIONS   RUN66 ROLL05 PITCH00
COURSE 090 E&M DIR. 144 DIST 4.17

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
5.00	1.000
4.50	0.987
4.00	0.974
3.50	0.934
3.00	0.882
2.50	0.776
2.00	0.579
1.50	0.434
1.00	0.263
0.50	0.066

ANTENNA SIMULATION

LENGTH OF ANTENNA	=	.95 METERS
HEIGHT OF ANTENNA	=	18.2 METERS
PHI OF ANTENNA	=	000 DEGREES RELATIVE
THETA OF ANTENNA	=	000 DEGREES RELATIVE
FREQUENCY	=	149.0 MHZ
EPSILON	=	80.0
SIGMA	=	5.0
PHI OF PLOT	=	036 DEGREES RELATIVE
THETA OF PLOT	=	089 DEGREES RELATIVE
SEA STATE	=	2
DIRECTION OF SEA	=	018 DEGREES RELATIVE

ROLL (DEGREES)	PITCH (DEGREES)	SIGNAL STRENGTH (DB)
.9	.0	4.879
1.7	.0	1.461
2.5	.0	1.506
3.2	.0	2.832
3.8	.0	3.384
4.3	.0	2.889
4.6	.0	2.361
4.9	.0	2.104
4.9	.0	2.036
4.9	.0	2.104
4.6	.0	2.361
4.3	.0	2.889
3.8	.0	3.384
3.2	.0	2.832
2.5	.0	1.506
1.7	.0	1.461
.9	.0	4.879
-.9	.0	5.078
-1.7	.0	1.589
-2.5	.0	1.415
-3.2	.0	2.595
-3.8	.0	3.337
-4.3	.0	3.062
-4.6	.0	2.574
-4.9	.0	2.288
-4.9	.0	2.203
-4.9	.0	2.288
-4.6	.0	2.574
-4.3	.0	3.062
-3.8	.0	3.337
-3.2	.0	2.595
-2.5	.0	1.415
-1.7	.0	1.589
-.9	.0	5.078

AVERAGE VALUE = 2.67 DB

DISTRIBUTION RUN67 ROLL05 PITCH00
COURSE 180 E&M DIR. 144 DIST 4.17

DATA POINTS

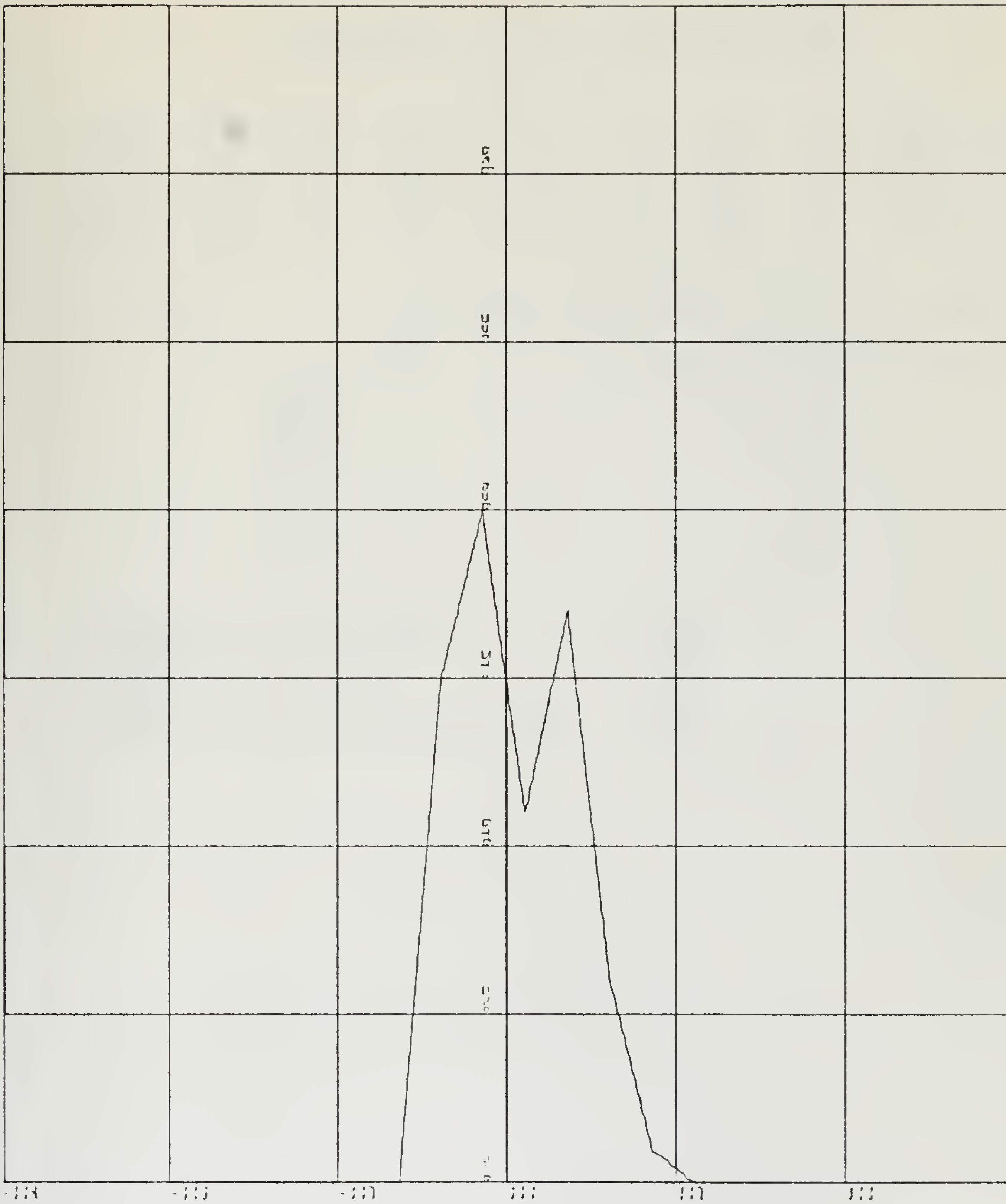
75.0	73.5	74.0	73.0	74.5	73.0	74.5	74.0	74.5
72.5	74.0	73.0	74.0	73.0	74.0	72.5	74.0	72.5
73.5	73.0	73.5	72.5	74.0	73.5	74.5	73.0	74.0
73.0	74.5	73.0	74.0	73.0	74.0	73.0	74.0	73.0
74.0	73.0	74.0	73.0	74.5	73.5	72.5	73.5	73.5
72.5	73.0	72.5	73.0	72.5	73.0	72.5	73.0	72.5
74.0	72.5	73.5	72.5	73.5	72.5	73.5	73.0	74.0
73.0	74.0	72.5	73.5	73.0	74.0	72.5		

AVERAGE POWER = 73.4DB   STANDARD DEVIATION = 0.5

GRAPHED DATA IS, NORMALIZED POWER VS. POINTS AT THAT POWER

NORMALIZED POWER, DB	POINTS AT THAT POWER
-2.25	0.0
-1.75	0.0
-1.25	0.0
-0.75	15.0
-0.25	20.0
0.25	11.0
0.75	17.0
1.25	6.0
1.75	1.0
2.25	0.0

NEGATIVE VALUES MEAN = -0.59
POSITIVE VALUES MEAN = 0.59
NEGATIVE VARIANCE = 0.06
POSITIVE VARIANCE = 0.15
NEGATIVE STANDARD DEVIATION = 0.25
POSITIVE STANDARD DEVIATION = 0.39



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
DISTRIBUTION RUN67 ROLL05 PITCH00
COURSE 180 E&M DIR. 144 DIST 4.17

VARIATIONS RUN67 ROLL05 PITCH00
COURSE 180 E&M DIR. 144 DIST 4.17

VARIATIONS

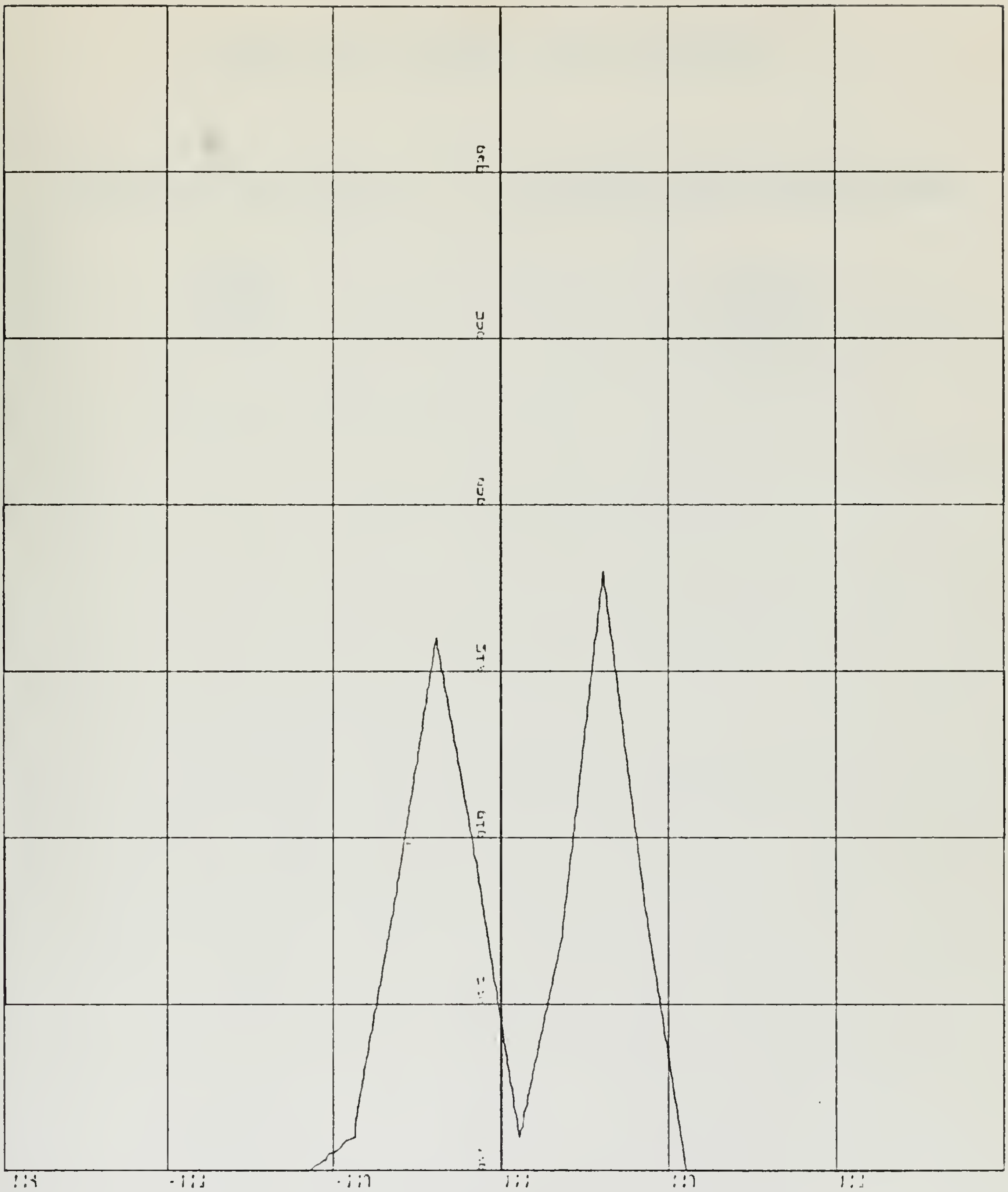
-1.5	0.5	-1.0	1.5	-1.5	1.5	-0.5	0.5	-2.0	1.5
-1.0	1.0	-1.0	1.0	-1.5	1.5	-1.5	1.0	-0.5	0.5
-1.0	1.5	-0.5	1.0	-1.5	1.0	-1.0	1.5	-1.5	1.0
-1.0	1.0	-1.0	1.0	-1.0	1.0	-1.0	1.0	-1.0	1.5
-1.0	-1.0	1.0	0.0	-1.0	0.5	-0.5	0.5	-0.5	0.5
-0.5	0.5	-0.5	1.5	-1.5	1.0	-1.0	1.0	-1.0	1.0
-0.5	1.0	-1.0	1.0	-1.5	1.0	-0.5	1.0		

AVE. VARIATION = -0.0DB STANDARD DEVIATION = 1.2

GRAPHED DATA IS, VARIATIONS VS. POINTS AT THAT VALUE

VARIATIONS, DB	POINTS AT THAT VALUE
-2.25	0.0
-1.75	1.0
-1.25	8.0
-0.75	16.0
-0.25	9.0
0.25	1.0
0.75	7.0
1.25	18.0
1.75	8.0
2.25	0.0

NEGATIVE VALUES MEAN = -1.01
POSITIVE VALUES MEAN = 1.02
NEGATIVE VARIANCE = 0.16
POSITIVE VARIANCE = 0.12
NEGATIVE STANDARD DEVIATION = 0.40
POSITIVE STANDARD DEVIATION = 0.34



X-SCALE=2.00E+00 UNITS INCH.
Y-SCALE=5.00E+00 UNITS INCH.
VARIATIONS RUN57 ROLL05 PITCH00
COURSE 180 E&M DIR. 144 DIST 4.17

VARIATIONS RUN67 ROLL05 PITCH00
COURSE 180 E&M DIR. 144 DIST 4.17

PEAK TO PEAK POWER (ABSOLUTE VALUE, DB)	PROBABILITY VARIATION WILL BE LESS THAN GIVEN AMMOUNT
2.00	1.000
1.50	0.868
1.00	0.485
0.50	0.147

```
C       COMPUTER GRAPHICS SOLUTION OF ANTENNA PATTERNS
C       DIMENSION PROBLEM AND SET UP GRAPHICS
        COMMON /IMP/ ZO,YO,L,DLPRI,LMDA,NN,WIRE,K,ADA,COSDL
        REAL K,L,LMDA,KCOS,NORM
        REAL KOS
        REAL KOS1,KOS2,KOS3,KOS4,KOS5,KOS6,KOS7,KOS8
        INTEGER VPAT,PATRN,PAR,E,ANTN
        COMPLEX DLTZ1,DLTZ2,ARGP,ARGM,ARGP2,ARGM2
        COMPLEX ARGU1,ARGU2,CEE,AJ,RVPRI
        COMPLEX ZMUTL
        COMPLEX RHPRI,ZM,Z,Z11,RH,RV,C2
        COMPLEX FIFA,VFAC,HFAC,ADA,ADA1,ADA2,GRAL,Y,ARG1
        COMPLEX SICI,W1,W2,W3,W4,W5
        DIMENSION ITDIR(45),IGDIR(6),IPAR(44),PATRN(362),
       1NW(44),LN(44),IP(44),IFO(44),X1(50),Y1(50),X2(90),
       1Y3(360),IMD(362),Z(2),ISAVV(92),ISAVH(362),ITRY(50),
       1IM(50),Y2(90),X3(360),VPAT(92),MC(44)
        DIMENSION G(2,360),FAC(450)
        DIMENSION X(500),Y(500)
C       PARAMETER FORMAT PROCESSOR
        DATA MC/4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,
       14,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4/
        DATA LN/1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,
       119,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,
       136,37,38,39,40,41,42,43,44/
        DATA NW/1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,
       11,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1/
        DATA IP/1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,
       11,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1/
        DATA(IPAR(I),I=2,44,2)/22*77777777B/
        ISIZE=6
        NAMELIST IDEV,IER
        OUTPUT(101)'TYPE IDEV'
        INPUT(101)
        CALL DTINIT(IDEV,ITDIR,45,IER)
        IF(IER.NE.0)OUTPUT(101)IER,'DTINIT'
        ASSIGN 1 TO IFO(1)
        ASSIGN 2 TO IFO(2)
        ASSIGN 3 TO IFO(3)
        ASSIGN 4 TO IFO(4)
        ASSIGN 5 TO IFO(5)
        ASSIGN 6 TO IFO(6)
        ASSIGN 7 TO IFO(7)
        ASSIGN 8 TO IFO(8)
        ASSIGN 9 TO IFO(9)
        ASSIGN 10 TO IFO(10)
        ASSIGN 11 TO IFO(11)
        ASSIGN 12 TO IFO(12)
        ASSIGN 13 TO IFO(13)
        ASSIGN 14 TO IFO(14)
        ASSIGN 15 TO IFO(15)
        ASSIGN 16 TO IFO(16)
        ASSIGN 17 TO IFO(17)
        ASSIGN 18 TO IFO(18)
        ASSIGN 19 TO IFO(19)
        ASSIGN 20 TO IFO(20)
        ASSIGN 21 TO IFO(21)
        ASSIGN 22 TO IFO(22)
        ASSIGN 123 TO IFO(23)
        ASSIGN 125 TO IFO(25)
        ASSIGN 127 TO IFO(27)
        ASSIGN 129 TO IFO(29)
        ASSIGN 131 TO IFO(31)
        ASSIGN 133 TO IFO(33)
        ASSIGN 135 TO IFO(35)
        ASSIGN 137 TO IFO(37)
        ASSIGN 139 TO IFO(39)
        ASSIGN 141 TO IFO(41)
        ASSIGN 143 TO IFO(43)
```

```
      ASSIGN 2 TO IFO(24)
      ASSIGN 2 TO IFO(26)
      ASSIGN 2 TO IFO(28)
      ASSIGN 2 TO IFO(30)
      ASSIGN 2 TO IFO(32)
      ASSIGN 2 TO IFO(34)
      ASSIGN 2 TO IFO(36)
      ASSIGN 2 TO IFO(38)
      ASSIGN 2 TO IFO(40)
      ASSIGN 2 TO IFO(42)
      ASSIGN 2 TO IFO(44)
      DO 50 I=1,44
   50 ENCODE(MC(I),IFO(I),IPAR(I))
  170 CONTINUE
      DO 114 I=1,50
  114 IM(I)=0
      DO 111 I=1,50
  111 X1(I)=Y1(I)=0.0
      DO 112 I=1,90
  112 X2(I)=Y2(I)=0.0
      DO 113 I=1,360
  113 X3(I)=Y3(I)=0.0
   33 CONTINUE
      DO 51 I=1,43,2
      CALL TEXTO(IDEV,IPAR(I),NW(I),LN(I),IP(I),1,3,IER)
   51 IF(IER.NE.0)OUTPUT(101)IER,'TBLK',I
C    PARAMETER AND OPTIONS COMMAND INPUT PROCESSOR
      DO 52 I=2,44,2
      CALL TEXTR(IDEV,IPAR(I),NW(I),LN(I),IP(I),1,3,IER)
      IF(IER.NE.0)OUTPUT(101)IER,'TBLK',I
      J=22+I/2
   53 IF(MOD(ITDIR(J),8).EQ.0) GO TO 53
      CALL TEXTI(IDEV,IPAR(I),NW(I),LN(I),IP(I),IER)
   52 IF(IER.NE.0)OUTPUT(101)IER,'IPAR',I
    1 FORMAT('ANTN')
    3 FORMAT('LENG')
    5 FORMAT('HGHT')
    7 FORMAT('PHIP')
    9 FORMAT('THEP')
   11 FORMAT('FREQ')
   13 FORMAT('EPSL')
   15 FORMAT('SGMA')
   17 FORMAT('PHI ')
   19 FORMAT('THET')
   21 FORMAT('PARM')
    2 FORMAT('    ')
    4 FORMAT('    ')
    6 FORMAT('    ')
    8 FORMAT('    ')
   10 FORMAT('    ')
   12 FORMAT('    ')
   14 FORMAT('    ')
   16 FORMAT('    ')
   18 FORMAT('    ')
   20 FORMAT('    ')
   22 FORMAT('    ')
  123 FORMAT('ISTH')
  125 FORMAT('ISTV')
  127 FORMAT('IRCL')
  129 FORMAT('TUNA')
  131 FORMAT('ALPH')
  133 FORMAT('GAIN')
  135 FORMAT('ISEA')
  137 FORMAT('ICRS')
  139 FORMAT('SIGL')
  141 FORMAT('    ')
  143 FORMAT('    ')
   95 FORMAT(F4.0)
   96 FORMAT(F4.1)
   97 FORMAT(F4.2)
   98 FORMAT(F4.3)
  101 FORMAT(I4)
```

```
      DECODE(4,101,IPAR(2))ANTN
      DECODE(4,97,IPAR(4))L
      DECODE(4,96,IPAR(6))H
      DECODE(4,101,IPAR(8))ITEM
      PHIPR=ITEM
      DECODE(4,101,IPAR(10))ITEM
      THEPR=ITEM
      DECODE(4,95,IPAR(12))F
      DECODE(4,96,IPAR(14))EPSLN
      DECODE(4,97,IPAR(16))SIGMA
      DECODE(4,101,IPAR(18))M
      DECODE(4,101,IPAR(20))KAY
      DECODE(4,101,IPAR(22))PAR
      DECODE(4,101,IPAR(24))ISTRH
      DECODE(4,101,IPAR(26))ISTRV
      DECODE(4,101,IPAR(28))IRCAL
      HT=0.00
      DECODE(4,98,IPAR(30))TUNA
      DECODE(4,101,IPAR(32))ITEM
      ALPH=ITEM
      DECODE(4,101,IPAR(36))ISEA
      DECODE(4,101,IPAR(38))ICRS
      IF(HT.EQ.(1.))SIGMA=SIGMA*.1
      IF(HT.EQ.(2.))SIGMA=SIGMA*.01
      IF(PAR.EQ.1)GO TO 170
      IF(HT.GT.75.0)L=L+100.0
      IF(HT.GT.85.0)L=L+200.0
      CALL DGINIT(IDEV,IGDIR,ISIZE,IER)
      DECODE(J,101,IPAR(8))IIP
      DECODE(J,101,IPAR(10))IIT
9000  WRITE(6,9001)
9001  FORMAT(1H1,24X,'ANTENNA SIMULATION',/)
9100  WRITE(6,9101) L
9101  FORMAT(16X,'LENGTH OF ANTENNA',7X,'=',F6.2,' METERS')
      WRITE(6,9111)H
9111  FORMAT(16X,'HIGHT OF ANTENNA',8X,'=',F6.1,' METERS')
      IIP=IIP+1000
      WRITE(6,9121)IIP
9121  FORMAT(16X,'PHI OF ANTENNA',10X,'=',3X,I3,
     1' DEGREES RELATIVE')
      IIT=IIT+1000
      WRITE(6,9131)IIT
9131  FORMAT(16X,'THETA OF ANTENNA',8X,'=',3X,I3,
     1' DEGREES RELATIVE')
      WRITE(6,9141) F
9141  FORMAT(16X,'FREQUENCY',15X,'=',F6.1,' MHZ')
      WRITE(6,9151)EPSLN
9151  FORMAT(16X,'EPSILON',17X,'=',F6.1)
      WRITE(6,9161)SIGMA
9161  FORMAT(16X,'SIGMA',19X,'=',F6.1)
      M=M+1000
      WRITE(6,9171)M
9171  FORMAT(16X,'PHI OF PLOT',13X,'=',3X,I3,
     1' DEGREES RELATIVE')
      M=M-1000
      KAY=KAY+1000
      WRITE(6,9181)KAY
9181  FORMAT(16X,'THETA OF PLOT',11X,'=',3X,I3,
     1' DEGREES RELATIVE')
      KAY=KAY-1000
      WRITE(6,9191)ISEA
9191  FORMAT(16X,'SEA STATE',15X,'=',I6)
      ICRS=ICRS+1000
      WRITE(6,9201)ICRS
9201  FORMAT(16X,'DIRECTION OF SEA',8X,'=',3X,I3,
     1' DEGREES RELATIVE',/)
      ICRS=ICRS-1000
      WRITE(6,9211)
9211  FORMAT(18X,'ROLL',10X,'PITCH',6X,
     1'SIGNAL STRENGTH')
      WRITE(6,9213)
9213  FORMAT(16X,'(DEGREES)',5X,'(DEGREES)',9X,'(DB)',/)
```

```
      IF(PAR.EQ.1)GO TO 170
C     PATTERN MANUAL ENTRY PROCESSOR
      DO 151 I=1,50
  151 IMD(I)=IM(I)
      ITRY(1)=IHEAD(0,10)
      ITRY(2)=IPACK(0,.6,0)
      ITRY(3)=IPACK(0,.4,1)
      ITRY(4)=IPACK(-.1,.5,0)
      ITRY(5)=IPACK(.1,.5,1)
      ITRY(6)=IPACK(0,-.6,0)
      ITRY(7)=IPACK(0,-.4,1)
      ITRY(8)=IPACK(-.1,-.5,0)
      ITRY(9)=IPACK(.1,-.5,1)
      ITRY(10)=IPACK(0,0,0)
      DO 153 I=11,50
      J=I-1
  153 ITRY(I)=IPACK(X1(I),Y1(I),IMD(I))
      CALL GRAPHR(IDEV,ITRY,50,1,IER)
      IF(IER.NE.0)OUTPUT(101) IER,'GBLK1'
  154 IF(MOD(IGDIR(1),8).EQ.0)GO TO 154
      CALL GRAPHI(IDEV,ITRY,1,IER)
      IF(IER.NE.0)OUTPUT(101)IER,'IGBLK'
      DO 155 I=1,50
      CALL UNPACK(ITRY(I),X1(I),Y1(I),IMD(I))
  155 IM(I)=IMD(I)
C     ENVORONMENTAL CONSTANTS PROCESSOR
      PHIPR=PHIPR*(3.14159265/180)
      THEPR=THEPR*(3.14159265/180)
      ALPH=(3.14159265/180)*ALPH
      ALPCM=(3.14159265/2.0)-ALPH
      DLPRI=(3.14159265/2.0)-THEPR
      F=F*1.0E 06
      AOMEG=2*3.14159265*F
      ADA1=CMPLX(0.0,1.26E-06*AOMEG)
      ADA2=CMPLX(SIGMA,AOMEG*EPSLN*8.854E-12)
      ADA=(ADA1/ADA2)**0.5
      TEMP1=REAL(ADA)
      TEMP2=AIMAG(ADA)
      LMDA=3.0E08/F
      K=6.28318530/LMDA
      F=F*1.0E-06
      C2=K*CMPLX(EPSLN,-1.8E04*SIGMA/F)**0.5
      RHPRI=(K-C2)/(K+C2)
      HTEMP=H
      THTEM=THEPR
      RVPRI=(C2-K)/(C2+K)
      JJJ=0
      AII=0.0
      AVE=0.0
      II=0
      DPHIP=0.0
      IF(ISEA.GT.0)GO TO 3000
 3010 CONTINUE
C     INPUT RESISTANCE PROCESSOR
      IF(ANTN.EQ.1)GO TO 1100
      IF(ANTN.EQ.2)GO TO 1200
      IF(ANTN.EQ.3)GO TO 1300
      IF(ANTN.EQ.4)GO TO 1400
      IF(ANTN.EQ.5)GO TO 1500
      IF(ANTN.EQ.6)GO TO 1600
      IF(ANTN.EQ.7)GO TO 1700
      IF(ANTN.EQ.8)GO TO 1800
 2000 CONTINUE
      IF(ISEA.GT.0)GO TO 3013
      WRITE(6,104)RIN
 3013 CONTINUE
  104 FORMAT(F12.4)
C     OBSERVATION ANGLE CONSTANTS PROCESSOR
      DO 42 N=1,2
      IF(N.EQ.1) GO TO 71
      IF(N.EQ.2) GO TO 72
   71 DO 42 I=1,90
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```
      J=M
      E=I
      GO TO 73
   72 DO 42 J=1,360
      I=KAY
      E=J
      GO TO 73
   73 CONTINUE
      THETA=I*(3.14159265/180)
      PHI=J*(3.14159265/180)
      KOS=COS(THETA)*COS(THEPR)+SIN(THETA)*SIN(THEPR)*
     1COS(PHI-PHIPP)
      SINSQ=1-(KOS**2)
      WOSQ=(3.14159265/180)**2
      IF(SINSQ.LT.WOSQ)SINSQ=WOSQ
      FIFA=(1-((K/C2)*SIN(THETA))**2)**0.5
      KCOS=COS(THETA)
      RV=(KCOS-(K/C2)*FIFA)/(KCOS+(K/C2)*FIFA)
      RH=(KCOS-(C2/K)*FIFA)/(KCOS+(C2/K)*FIFA)
      VR=REAL(RV)
      VI=AIMAG(RV)
      SIGHV=ATAN2(VI,VR)
      HR=REAL(RH)
      HI=AIMAG(RH)
      SIGHH=ATAN2(HI,HR)
C     GAIN PROCESSOR
      IF(ANTN.EQ.1)GO TO 100
      IF(ANTN.EQ.2)GO TO 200
      IF(ANTN.EQ.3)GO TO 300
      IF(ANTN.EQ.4)GO TO 400
      IF(ANTN.EQ.5)GO TO 500
      IF(ANTN.EQ.6)GO TO 600
      IF(ANTN.EQ.7)GO TO 700
      IF(ANTN.EQ.8)GO TO 800
   42 CONTINUE
C     NORMALIZE AND MAX GAIN PROCESSOR
      N=1
      DO 43 J=1,2
      IF(J.EQ.1) GO TO 75
      IF(J.EQ.2) GO TO 76
   75 DO 43 I=1,90
      GO TO 77
   76 DO 43 I=1,360
      GO TO 77
   77 CONTINUE
      FAC(N)=G(J,I)
   43 N=N+1
      NORM=0.0
      DO 46 I=1,450
   46 NORM=AMAX1(NORM,FAC(I))
      GAIN=NORM/RIN
      IF(GAIN.GT.(.001)) GO TO 9700
      ATEMP=00.0
      GO TO 9772
 9700 ATEMP=ALOG10(GAIN)
 9772 ENCODE(4,96,IPAR(34))ATEMP
      CALL TEXTO(IDEV,IPAR(34),1,34,1,1,3,IER)
      IF(IER.NE.0)OUTPUT(101)IER,'GAIN'
      IF(ISEA.GT.0)GO TO 3020
      GAIN=10.*ATEMP
      IF(PAR.EQ.2)GO TO 171
  181 CONTINUE
 3021 CONTINUE
C     PATTERN DISPLAY PROCESSOR
      DO 44 I=1,360
      PHI=I*(3.14159265/180)
      G(2,I)=G(2,I)/(NORM*2.0)
      X(I)=G(2,I)*COS(PHI)
   44 Y(I)=G(2,I)*SIN(PHI)+0.5
      IMD(1)=0
      DO 45 I=2,360
   45 IMD(I)=1
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      PATRN(1)=IHEAD(0,10)
      DO 47 I=2,361
      J=I-1
   47 PATRN(I)=IPACK(X(J),Y(J),IMD(J))
      PATRN(362)=0
      IF(ISEA.GT.0)GO TO 3030
      CALL GRAPHR(IDEV,PATRN,362,2,IER)
      IF(IER.NE.0)OUTPUT(101)IER,'GBLK'
   60 IF(MOD(IGDIR(2),8).EQ.0)GO TO 60
 3011 CONTINUE
      IF(ISTRH.EQ.1) GO TO 156
  158 CONTINUE
C     DISPLAY VERT PATTERN AT REQUESTED PHI
      DO 49 I=1,90
      THETA=I*(3.14159265/180)
      G(1,I)=G(1,I)/(NORM*2.0)
      X(I)=G(1,I)*SIN(THETA)
   49 Y(I)=G(1,I)*COS(THETA)-0.5
      IMD(1)=0
      DO 61 I=2,90
   61 IMD(I)=1
      VPAT(1)=IHEAD(0,10)
      DO 62 I=2,91
      J=I-1
   62 VPAT(I)=IPACK(X(J),Y(J),IMD(J))
      VPAT(92)=0
      IF(ISEA.GT.0)GO TO 3040
      CALL GRAPHR(IDEV,VPAT,92,3,IER)
      IF(IER.NE.0) OUTPUT(101)IER,'GBLK2'
   64 IF(MOD(IGDIR(3),8).EQ.0)GO TO 64
 3012 CONTINUE
      IF(ISTRV.EQ.1)GO TO 159
  161 CONTINUE
      IF(IRCAL.EQ.1)GO TO 162
      IF(ISEA.GT.0)GO TO 3000
      GO TO 33
C     PATTERN SAVE PROCESSOR
  156 CALL GRAPHI(IDEV,PATRN,2,IER)
      IF(IER.NE.0)OUTPUT(101)IER,'GBLK2'
      DO 157 I=1,360
  157 CALL UNPACK(PATRN(I+1),X3(I),Y3(I),IMD(I))
      GO TO 158
  159 CALL GRAPHI(IDEV,VPAT,3,IER)
      IF(IER.NE.0)OUTPUT(101)IER,'GBLK3'
      DO 160 I=1,90
  160 CALL UNPACK(VPAT(I+1),X2(I),Y2(I),IMD(I))
      GO TO 161
C     DISPLAY SAVED PATTERNS PROCESSOR
  162 IMD(1)=0
      ISAVH(1)=IHEAD(0,10)
      DO 163 I=2,360
  163 IMD(I)=1
      DO 164 I=2,361
      J=I-1
  164 ISAVH(I)=IPACK(X3(J),Y3(J),IMD(J))
      ISAVH(362)=0
      CALL GRAPHR(IDEV,ISAVH,362,4,IER)
      IF(IER.NE.0)OUTPUT(101)IER,'GBLK4'
  166 IF(MOD(IGDIR(4),8).EQ.0)GO TO 166
      ISAVV(1)=IHEAD(0,10)
      DO 167 I=2,91
      J=I-1
  167 ISAVV(I)=IPACK(X2(J),Y2(J),IMD(J))
      ISAVV(92)=0
      CALL GRAPHR(IDEV,ISAVV,92,5,IER)
      IF(IER.NE.0)OUTPUT(101)IER,'GBLK5'
  169 IF(MOD(IGDIR(5),8).EQ.0)GO TO 169
      GO TO 33
C     LOG GAIN PROCESSOR
  171 BLIM=.001
      DO 172 I=1,90
      TEMP=G(1,I)/NORM
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      IF(TEMP.LT.BLIM)TEMP=BLIM
      IF(TEMP.GT.(.001)) GO TO 9751
      G(1,I)=3.0
      GO TO 172
9751  G(1,I)=ALOG10(TEMP)+3.0
 172  CONTINUE
      DO 173 I=1,360
      TEMP=G(2,I)/NORM
      IF(TEMP.LT.BLIM)TEMP=BLIM
      IF(TEMP.GT.(.001)) GO TO 9752
      G(2,I)=3.0
      GO TO 173
9752  G(2,I)=ALOG10(TEMP)+3.0
 173  CONTINUE
 190  FORMAT(2F12.8,I5)
      NORM=3.0
      GO TO 181
3000  II=II+1
      II=MOD(II,36)
      PI=3.14159265
      D2R=PI/180.0
      VAR=(PI/18.0)*II
      WAVE=(ISEA*8*SIN(VAR))*D2R
      VAR1=ICRS*D2R
      DLT1=WAVE*SIN(VAR1)
      DLT2=WAVE*COS(VAR1)*TUNA
      IF(ANTN.EQ.5)GO TO 3500
      H=HTEMP*COS(DLT1)*COS(DLT2)
      THEPR=THTEM-DLT1
      DLPRI=PI/2.-THEPR
      GO TO 3090
3500  AA=2*L*SIN(DLT1/2.)
      BB=2*L*SIN(DLT2/2.)
      CC=SQRT(AA**2+BB**2)
      DD=SQRT(L**2-(CC/2.)**2)
      DLT3=2.*ATAN2((CC/2.),DD)
      SIND3=SIN(DLT3)
      IF((SIND3.LT.WOSQ).AND.(SIND3.GE.0.0))SIND3=WOSQ
      IF((SIND3.GT.-WOSQ).AND.(SIND3.LT.0.0))SIND3=-WOSQ
      SINA=SIN(DLT1)/SIND3
      SINA=ABS(SINA)
      COSA=SQRT(1.0-SINA**2)
      DPHIP=ATAN2(SINA,COSA)
      IF((DLT1.LT.0.0).AND.(DLT2.GE.0.0))DPHIP=-DPHIP
      IF((DLT1.LT.0.0).AND.(DLT2.LT.0.0))DPHIP=-(PI-DPHIP)
      IF((DLT1.GT.0.0).AND.(DLT2.LT.0.0))DPHIP=PI-DPHIP
      THEPR=THTEM+DLT3
      DLPRI=PI/2.-THEPR
3090  JJJ=JJJ+1
      IF(JJJ.LT.37) GO TO 3010
      WRITE(6,9555)AVE
9555  FORMAT(/,16X,'AVERAGE VALUE =',F6.2,' DB')
      GO TO 33
3020  TEMP=G(1,KAY)/RIN
      IF(TEMP.GT.(0.001)) GO TO 9951
      SIGL=0.0
      GO TO 9952
9951  SIGL=ALOG10(TEMP)
9952  ENCODE(4,96,IPAR(40))SIGL
      CALL TEXTO(IDEV,IPAR(40),1,40,1,1,3,IER)
      IF(IER.NE.0)OUTPUT(101)IER,'SIGL'
      SIG=10*SIGL
      DLT1A=DLT1*(180./3.14159265)
      DLT2A=DLT2*(180./3.14159265)
      IF(DLT1A.GT.(-.099)) GO TO 9314
      GO TO 9617
9314  IF(DLT1A.LT.(.099)) GO TO 9217
      GO TO 9617
9217  IF(DLT2A.GT.(-.099)) GO TO 9227
      GO TO 9617
9227  IF(DLT2A.LT.(.099)) GO TO 9207
9617  WRITE(6,9200)DLT1A,DLT2A,SIG
```

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9200 FORMAT(16X,F6.1,10X,F5.1,10X,F6.3)
     AII=AII+1
     AVE=AVE-(AVE-SIG)/AII
9207 WSIG=SIG/30.
     CALL DAC(2,WSIG)
     GO TO 3021
3030 CALL GRAPHO(IDEV,PATRN,362,2,IER)
     IF(IER.NE.0)OUTPUT(101)IER,'HPAT'
     GO TO 3011
3040 CALL GRAPHO(IDEV,VPAT,92,3,IER)
     IF(IER.NE.0)OUTPUT(101)IER,'VPAT'
     GO TO 3012
C    ARBITRARILY TILTED DIPOLE
 100 DELTA=(3.14159265/2.-THETA)
     S1=COS(SIGHH-2*K*H*SIN(DELTA))
     S2=SIN(SIGHH-2*K*H*SIN(DELTA))
     S3=COS(SIGHV-2*K*H*SIN(DELTA))
     S4=SIN(SIGHV-2*K*H*SIN(DELTA))
     CV=CABS(RV)
     CH=CABS(RH)
     COSDL=COS(DELTA)
     SINDL=SIN(DELTA)
     SINDP=SIN(DLPRI)
     COSDP=COS(DLPRI)
     SINPI=SIN(PHI-PHIPR)
     COSPI=COS(PHI-PHIPR)
     FCT=1.0-(SINDL*SINDP+COSDL*COSDP*SINPI)**2
     FCTR=1.0-(-SINDP*SINDL+COSDL*COSDP*SINPI)**2
     GI=(COS(0.5*K*L*(SINDL*SINDP+COSDL*COSDP*SINPI))
    1-COS(0.5*K*L))/FCT
     DI=(COS(0.5*K*L*(COSDL*COSDP*SINPI-SINDL*SINDP))
    1-COS(0.5*K*L))/FCTR
     ETHT1=(COSDP*SINPI*SINDL-SINDP*COSDL)*GI-(COSDP*SINPI*
    1SINDL+SINDP*COSDL)*DI*CV*S3
     EPHI1=COSDP*COSPI*(GI+DI*CH*S1)
     ETHT2=(COSDP*SINPI*SINDL+SINDP*COSDL)*DI*CV*S4
     EPHI2=COSDP*COSPI*DI*CH*S2
     IF(FCT.LT.WOSQ)ETHT1=EPHI1=0.0
     IF(FCTR.LT.WOSQ)ETHT2=EPHI2=0.0
     G(N,E)=120.*(ETHT1**2+ETHT2**2+EPHI1**2+EPHI2**2)
     GO TO 42
1100 SAVIT=DLPRI
     DO 1110 I=1,2
     Y0=.00001
     Z0=0.0
     IF(I.EQ.1)DLPRI=0.0
     IF(I.EQ.2)DLPRI=SAVIT
     IF(I.EQ.2)Y0=2.*H*COS(DLPRI)/LMDA
     S=-0.5*L/LMDA
     RGRAL=RESIST(S)/2
     DS=L/(LMDA*100)
     DO 1115 N=2,100
     S=S+DS
1115 RGRAL=RESIST(S)+RGRAL
     RGRAL=-30.0*(RGRAL+(RESIST(0.5*L/LMDA))/2.)*DS
     S=-0.5*L/LMDA
     XGRAL=REACT(S)/2.
     DO 1116 N=2,100
     S=S+DS
1116 XGRAL=XGRAL+REACT(S)
     XGRAL=-30.0*(XGRAL+(REACT(0.5*L/LMDA))/2)*DS
1110 Z(I)=CMPLX(RGRAL,XGRAL)
     AJ=CMPLX(0,1)
     ONE=COS(DLPRI)
     TWO=-SIN(DLPRI)
     CEE=(RHPRI*COS(DLPRI)+AJ*RVPRI*SIN(DLPRI))*
    1CMPLX(ONE,TWO)
     RIN=REAL(Z(1))+REAL(Z(2)*CEE)
     GO TO 2000
1500 CALL SINUS((2*K*L),SC)
     SI1=-SC
     CALL KOSINUS((2*K*L),CC)
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      CI1=CC
      CALL KOSINUS((4*K*L),CC)
      CI2=CC
      CALL SINUS((4*K*L),SC)
      SI2=-SC
      TUN2=K*L
      IF(TUN2.GT.(.001)) GO TO 9955
      RIN=30.0*(0.5*(0.577-CI2)+.693+COS(K*L)*(COS(K*L)*
     1(.577-2*CI1+CI2)-SIN(K*L)*(SI2-2.*SI1)))
      GO TO 9956
 9955 RIN=30.0*(0.5*(ALOG(K*L)+0.577-CI2)+.693+COS(K*L)*
     1(COS(K*L)*
     1(ALOG(K*L)+.577-2*CI1+CI2)-SIN(K*L)*(SI2-2.*SI1)))
 9956 GO TO 2000
C     VERTICAL HALF RHOMBIC
  800 DELTA=(3.14159265/2.0)-THETA
      COSDL=COS(DELTA)
      SINDL=SIN(DELTA)
      COSAC=COS(ALPCM)
      SINAC=SIN(ALPCM)
      COSPI=COS(PHI)
      SINPI=SIN(PHI)
      FACK1=1.0-COSDL*COSAC*COSPI-SINDL*SINAC
      FACK2=1.0-COSDL*COSAC*COSPI+SINDL*SINAC
      UU1=COS(SIGHH-2*K*H*SINDL)
      UU2=SIN(SIGHH-2*K*H*SINDL)
      UU3=COS(SIGHV-2*K*H*SINDL)
      UU4=SIN(SIGHV-2*K*H*SINDL)
      S1=SIN(K*L*FACK1)
      CE1=COS(K*L*FACK1)
      S2=SIN(K*L*FACK2)
      CE2=COS(K*L*FACK2)
      R1=(1.0-CE1)/FACK1
      AI1=S1/FACK1
      R2=(CE1*(1.0-CE2)+S1*S2)/FACK2
      AI2=(CE1*S2-S1*(1.0-CE2))/FACK2
      R3=(1.0-CE1)*COS(2*K*L*SINAC*SINDL)-(1.0-CE1)*SIN(2*K*
     1L*SINAC*SINDL)
      F1=(AI3*CE1-R3*S1)/FACK1
      F2=(R3*CE1+AI3*S1)/FACK1
      F3=(1.0-CE2)/FACK2
      F4=S2/FACK2
      RB=R1+R2+CABS(RV)*((F2+F3)*UU3-(F1+F4)*UU4)
      BI=AI1+AI2-CABS(RV)*((F2+F3)*UU4+(F1+F4)*UU3)
      RC=R2-R1+CABS(RV)*((F2-F3)*UU3-(F1-F4)*UU4)
      CC=AI2-AI1+CABS(RV)*((F2-F3)*UU4+(F1-F4)*UU3)
      RA=R1+R2+CABS(RH)*((F2+F3)*UU1+(F1+F4)*UU2)
      A1=AI1+AI2+CABS(RH)*((F2+F3)*UU2+(F1+F4)*UU1)
      G(N,E)=0.1*((RB*COSAC*COSPI*SINDL+RC*SINAC*COSDL)**2
     1+(BI*COSAC*COSPI*SINDL+CC*SINAC*COSDL)**2+(RA*COSAC*
     1SINPI)**2+(A1*COSAC*SINPI)**2)
      GO TO 42
C     VERTICAL HALF RHOMBIC
 1800 RIN=1.0
      GO TO 2000
C     SLOPING VEE
  600 DELTA=(3.14159265/2.0)-THETA
      SINDL=SIN(DELTA)
      SINDP=SIN(DLPRI)
      COSDL=COS(DELTA)
      COSDP=COS(DLPRI)
      ADJ=COS(ALPH)*COSDP
      OPP=SIN(ALPH)
      ALPH=ATAN2(OPP,ADJ)
      COSP=COS(PHI+ALPH)
      COSM=COS(PHI-ALPH)
      KOS1=SINDL*SINDP+COSDL*COSDP*COSM
      KOS2=SINDL*SINDP+COSDL*COSDP*COSP
      KOS3=-SINDL*SINDP+COSDL*COSDP*COSM
      KOS4=-SINDL*SINDP+COSDL*COSDP*COSP
      KOS5=COSDL*SINDP+SINDL*COSDP*COSM
      KOS6=COSDL*SINDP+SINDL*COSDP*COSP
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      KOS7=-COSDL*SINDP+SINDL*COSDP*COSM
      KOS8=-COSDL*SINDP+SINDL*COSDP*COSP
      U1=K*L*(1.0-KOS1)
      U2=K*L*(1.0-KOS2)
      U3=K*L*(1.0-KOS3)
      U4=K*L*(1.0-KOS4)
      S1=COS(SIGHH-2*K*H*SINDL)
      S2=SIN(SIGHH-2*K*H*SINDL)
      S3=COS(SIGHV-2*K*H*SINDL)
      S4=SIN(SIGHV-2*K*H*SINDL)
      COSU1=COS(U1)
      COSU2=COS(U2)
      COSU3=COS(U3)
      COSU4=COS(U4)
      SINU1=SIN(U1)
      SINU2=SIN(U2)
      SINU3=SIN(U3)
      SINU4=SIN(U4)
       A=(KOS7*(COSU1-1.)/U1-KOS8*(COSU2-1.)/U2)+CABS(RV)*(
     1(KOS6*(
     1(COSU4-1.)*S3+SINU4*S4)/U4)-KOS5*((COSU3-1.)*S3+SINU3*
     1S4)/U3)
      B=(KOS8*SINU2/U2-KOS7*SINU1/U1)+CABS(RV)*(KOS5*(SINU3*
     1S3-(COSU3-1.
     1)*S4)/U3+KOS6*((COSU4-1.)*S4-SINU4*S3)/U4)
      C=SIN(PHI+ALPH)*(COSU2-1.)/U2-SIN(PHI-ALPH)*(COSU1-1.)
     1/U1
     1+CABS(RH)*((SIN(PHI+ALPH)*(COSU4-1.)/U4-SIN(PHI-ALPH)*
     1(COSU3-1.)
     1/U3)*S1-(SIN(PHI-ALPH)*SINU3/U3-SIN(PHI+ALPH)*SINU4/U4
     1)*S2)
      D=SIN(PHI-ALPH)*SINU1/U1-SIN(PHI+ALPH)*SINU2/U2+CABS(
     1RH)*((SIN(PHIC
     1-ALPH)*SINU3/U3-SIN(PHI+ALPH)*SINU4/U4)*S1+(SIN(PHI+
     1ALPH)*
     1(COSU4-1.)/U4-SIN(PHI-ALPH)*(COSU3-1.)/U3)*S2)
      G(N,E)=0.05*(A**2+B**2+COSDP**2*(C**2+D**2))
      GO TO 42
C     VERTICAL MONOPOLE
C     VERTICAL MONOPOLE GAIN
  200 DELTA=3.14159264/2.-THETA
      SINDL=SIN(DELTA)
      COSDL=COS(DELTA)
      CV=CABS(RV)
      S3=COS(SIGHV)
      S4=SIN(SIGHV)
      A=COS(K*L*SINDL)-COS(K*L)
      B=SIN(K*L*SINDL)-SINDL*SIN(K*L)
      G(N,E)=(30.0/COSDL**2)*((A*(1.+CV*S3)+B*CV*S4)**2+
     1(B*(1.-CV*S3)+A*CV*S4)**2)
      GO TO 42
C     VERTICAL MONOPOLE
 1200 CALL KOSINUS((4*K*L),CC)
      CIN2=ALOG(4*K*L)+.577-CC
      CALL KOSINUS((2*K*L),CC)
      CIN1=ALOG(2*K*L)+.577-CC
      CALL SINUS((4*K*L),SC)
      SIN2=1.57078633+SC
      CALL SINUS((2*K*L),SC)
      SIN1=1.57078633+SC
      RIN=15.*((2.+2*COS(2*K*L))*CIN1-COS(2*K*L)*CIN2-2*SIN(
     12*K*L*)*SIN1+
     1SIN(2*K*L)*SIN2)
      GO TO 2000
C     INVERTED L
  400 DELTA=(3.14159265/2.)-THETA
      SINDL=SIN(DELTA)
      COSDL=COS(DELTA)
      CV=CABS(RV)
      CH=CABS(RH)
      DENM1=1.0-COSDL**2*SIN(PHI)**2
      S1=COS(SIGHH-2*K*H*SINDL)
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      S2=SIN(SIGHH-2*K*H*SINDL)
      S3=COS(SIGHV-2*K*H*SINDL)
      S4=SIN(SIGHV-2*K*H*SINDL)
      A=COS(K*L)*COS(K*H*SINDL)-SINDL*SIN(K*L)*SIN(K*H*
     1SINDL)
     1-COS(K*(H+L))
      B=SINDL*SIN(K*L)*COS(K*H*SINDL)+COS(K*L)*SIN(K*H*
     1SINDL)
     1-SINDL*SIN(K*(H+L))
      GI=SIN(K*L*COSDL*SIN(PHI))-COSDL*COS(PHI)*SIN(K*L)
      GR=COS(K*L*COSDL*SIN(PHI))-COS(K*L)
      ETHET=((SIN(PHI)*SINDL*(GR*(1.0-CV*S3)+GI*CV*S4)/
     1DENM1)
     1-(A*(1.0+CV*COS(SIGHV))+B*CV*SIN(SIGHV))/COSDL)**2
     1+((SIN(PHI)*SINDL*(GI*(1.0-CV*S3)-GR*CV*S4)/DENM1)
     1-(B*(1.0-CV*COS(SIGHV))+A*CV*SIN(SIGHV))/COSDL)**2
      EPHI=(COS(PHI)/DENM1)**2*((GR*(1.0+CH*S1)-GI*CH*S2)**2
     1+(GI*(1.0+CH*S1)+GR*CH*S2)**2)
      G(N,E)=30.0*(ETHET+EPHI)
      GO TO 42
C     INVERTED L
 1400 CALL KOSINUS((2*K*H),CC)
      CI1=CC
      CALL KOSINUS((4*K*H),CC)
      CI2=CC
      CALL SINUS((2*K*H),SC)
      SI1=-SC
      CALL SINUS((4*K*H),SC)
      SI2=-SC
      RIN=60.*(1.41+ALOG(2*L/LMDA)+SINC(2*K*L))+30.*(-0.5*
     1COS(2*K*H)*
     1(ALOG(2*K*H)+1.270+CI2)+(1.0+COS(2*K*H))*(ALOG(2*K*H)+
     10.577-CI1)-
     1SIN(2*K*H)*(0.5*SI2-SI1))
      GO TO 2000
C     VERTICAL MONOPOLE WITH GROUND SCREEN
  300 DELTA=3.14159265/2.-THETA
      IF((N.EQ.2).AND.(J.GT.1))GO TO 310
      SINDL=SIN(DELTA)
      COSDL=COS(DELTA)
      CV=CABS(RV)
      S3=COS(SIGHV)
      S4=SIN(SIGHV)
      A=COS(K*L*SINDL)-COS(K*L)
      B=SIN(K*L*SINDL)-SINDL*SIN(K*L)
      C1=SIN(K*L)
      IF((C1.LT.WOSQ).AND.(C1.GE.0.0))C1=WOSQ
      IF((C1.GT.-WOSQ).AND.(C1.LT.0.0))C1=-WOSQ
      C3=A
      IF((C3.LT.WOSQ).AND.(C3.GE.0.0))C3=WOSQ
      IF((C3.GT.-WOSQ).AND.(C3.LT.0.0))C3=-WOSQ
      XB=K*H
      DX=XB/100
      XX=0
      GRAL=PTGRL(XX)/2
      DO 315 II=2,100
      XX=XX+DX
  315 GRAL=GRAL+PTGRL(XX)
      GRAL=(GRAL+PTGRL(XB)/2)*DX
      GRAL=1.0-(ADA*SIN(THETA)*GRAL)/120.*3.14159265*C1*C3
      SRFAC=(CABS(GRAL))**2
      WRITE(6,311)SRFAC
  311 FORMAT('SRFAC=',F12.6)
  310 CONTINUE
      G(N,E)=(30.0/COSDL**2)*((A*(1.+CV*S3)+B*CV*S4)**2+
     1(B*(1.-CV*S3)+A*CV*S4)**2)*SRFAC/C1**2
      GO TO 42
C     GROUND SCREEN
 1300 C1=SIN(K*L)**2
      IF(C1.LT.WOSQ)C1=WOSQ
      R0=(H**2+L**2)**0.5
      R1=H+R0
```

```
      ARGP=CMPLX(0.0,K*L)
      ARGM=CMPLX(0.0,-K*L)
      ARGP2=CMPLX(0.0,2*K*L)
      ARGM2=CMPLX(0.0,-2*K*L)
      DLTZ1=(ADA/4*3.14159265*C1)*(CEXP(ARGP2)*AKEX(-2*K
     1*(RO+L))+
     1CEXP(ARGM2)*AKEX(-2*K*(RO-L))+2*COS(K*L)**2*AKEX(-2*K*
     1H)+
     14*COS(K*L)*AKEX(-K*R1)-4*COS(K*L)*CEXP(ARGM)*AKEX(-K*(
     1R1-L))-
     14*COS(K*L)*CEXP(ARGP)*AKEX(-K*(R1+L)))
      WRITE(6,1311)DLTZ1
 1311 FORMAT('DLTZ1=',F12.6)
      NN=120
      WIRE=.01
      DX=(H-.01)/100
      DUM=.01
      DLTZ2=ZGRAL(DUM)/2.
      DO 1310 II=2,100
      DUM=DUM+DX
 1310 DLTZ2=DLTZ2+ZGRAL(DUM)
      DLTZ2=(DLTZ2+ZGRAL(H)/2.)*DX
      DLTZ2=-DLTZ2
      WRITE(6,1312)DLTZ2
 1312 FORMAT('DLTZ2=',F12.6)
      CALL KOSINUS((4*K*L),CC)
      CIN2=ALOG(4*K*L)+.577-CC
      CALL KOSINUS((2*K*L),CC)
      CIN1=ALOG(2*K*L)+.577-CC
      CALL SINUS((4*K*L),SC)
      SIN2=1.57078633+SC
      CALL SINUS((2*K*L),SC)
      SIN1=1.57078633+SC
      RIN=15.*((2.+2*COS(2*K*L))*CIN1-COS(2*K*L)*CIN2-2*SIN(
     1*K*L)*SIN1
     1+SIN(2*K*L)*SIN2)
      RIN=RIN+REAL(DLTZ1+DLTZ2)
      GO TO 2000
C     SLOPING LONG WIRE
C     SLOPE LONGWIRE
  500 DELTA=3.14159265/2.0-THETA
      PHI=PHI-DPHIP
      COSDL=COS(DELTA)
      SINDL=SIN(DELTA)
      COSDP=COS(DLPRI)
      SINDP=SIN(DLPRI)
      COSPI=COS(PHI)
      SINPI=SIN(PHI)
      FCT1=1.0-(SINDL*SINDP+COSDL*COSDP*COSPI)**2
      FCT2=1.0-(COSDL*COSDP*COSPI-SINDL*SINDP)**2
      CIG=(COS(K*L*(SINDL*SINDP+COSDL*COSDP*COSPI))-COS(K*L)
     1/FCT1
      SIG=(SIN(K*L*(SINDL*SINDP+COSDL*COSDP*COSPI))-
     1(SINDL*SINDP+COSDL*COSDP*COSPI)*SIN(K*L))/FCT1
      CIGP=(COS(K*L*(COSDL*COSDP*COSPI-SINDL*SINDP))-COS(K*
     1L))/FCT2
      SIGP=(SIN(K*L*(COSDL*COSDP*COSPI-SINDL*SINDP))+
     1(SINDL*SINDP-COSDL*COSDP*COSPI)*SIN(K*L))/FCT2
      CH=CABS(RH)
      CV=CABS(RV)
      EPHI1=-COSDP*SINPI*(CIG+CH*(CIGP*COS(SIGHH)-SIGP*SIN(
     1SIGHH)))
      EPHI2=-COSDP*SINPI*(SIG+CH*(CIGP*SIN(SIGHH)+SIGP*COS(
     1SIGHH)))
      ETHT1=CIG*(COSDP*COSPI*SINDL-SINDP*COSDL)-CV*(COSDP*
     1COSPI*SINDL+
     1SINDP*COSDL)*(CIGP*COS(SIGHV)-SIGP*SIN(SIGHV))
      ETHT2=SIG*(COSDP*COSPI*SINDL-SINDP*COSDL)-CV*(COSDP*
     1COSPI*SINDL+
     1SINDP*COSDL)*(CIGP*SIN(SIGHV)+SIGP*COS(SIGHV))
      IF(FCT1.LT.WOSQ)ETHT1=ETHT2=EPHI1=EPHI2=0.0
      G(N,E)=30.0*(EPHI1**2+EPHI2**2+ETHT1**2+ETHT2**2)
```

```
      IF((FCT1.LT.WOSG).AND.(FCT2.LT.WOSQ))G(N,E)=0.1
      GO TO 42
      END


      SUBROUTINE SINUS(X,SC)
      IF(X.GE.10.0)GO TO 10
      DX=X/100
      GRAL=0.5
      XA=0.0
      DO 100 I=2,100
      XA=XA+DX
  100 GRAL=GRAL+SINC(XA)
      GRAL=(GRAL+SINC(X)/2.)*DX
      SC=-3.14159265/2.+GRAL
      GO TO 20
   10 SC=-COS(X)/X
   20 CONTINUE
      RETURN
      END


      SUBROUTINE KOSINUS(X,CC)
      IF(X.GE.10.0)GO TO 10
      DX=X/100
      GRAL=0.0
      XA=0.0
      DO 100 I=2,100
      XA=XA+DX
  100 GRAL=GRAL+(1.0-COS(XA))/XA
      GRAL=(GRAL+(1.0-COS(X))/2*X)*DX
      CC=ALOG(1.781072*X)-GRAL
      GO TO 20
   10 CC=SIN(X)/X
   20 CONTINUE
      RETURN
      END


      FUNCTION CINC(X)
      CINC=COS(X)/X
      RETURN
      END


      FUNCTION SINC(X)
      SINC=SIN(X)/X
      RETURN
      END


      FUNCTION RESIST(S)
C REQUIRED FOR DIPOLE
      REAL L,LMDA,K
      COMPLEX ADA
      COMMON /IMP/ Z0,Y0,L,DLPRI,LMDA,NN,WIRE,K,ADA,COSDL
      PI=3.14159265
      SZ=S*COS(2*DLPRI)
      SY=-S*SIN(2*DLPRI)
      TERM=Y0+SY
      ROW2=(Y0+SY)**2
      CA=Z0+SZ
      CA1=CA+0.5*L/LMDA
      CA2=CA-0.5*L/LMDA
      R=SQRT(ROW2+CA**2)
      R1=SQRT(ROW2+CA1**2)
      R2=SQRT(ROW2+CA2**2)
      SR=SIN(2*PI*R)/R
      SR1=SIN(2*PI*R1)/R1
      SR2=SIN(2*PI*R2)/R2
      FACR=2*SR*COS(PI*L/LMDA)
      RESIST=(((SR1*CA1+SR2*CA2-FACR*CA)*SY)/TERM+(FACR-SR1-
```

```
     1SR2)*SZ)*SIN(2*PI*(0.5*L/LMDA-ABS(S)))/S

      FUNCTION REACT(S)
C REQUIRED FOR DIPOLE
      COMPLEX ADA
      REAL L,LMDA,K
      COMMON /IMP/ ZO,YO,L,DLPRI,LMDA,NN,WIRE,K,ADA,COSDL
      PI=3.14159265
      SZ=S*COS(2*DLPRI)
      SY=-S*SIN(2*DLPRI)
      TERM=YO+SY
      ROW2=(YO+SY)**2
      CA=ZO+SZ
      CA1=CA+0.5*L/LMDA
      CA2=CA-0.5*L/LMDA
      R=SQRT(ROW2+CA**2)
      R1=SQRT(ROW2+CA1**2)
      R2=SQRT(ROW2+CA2**2)
      CR=COS(2*PI*R)/R
      CR1=COS(2*PI*R1)/R1
      CR2=COS(2*PI*R2)/R2
      FACX=2*CR*COS(PI*L/LMDA)
      REACT=(((CR1*CA1+CA2*CR2-FACX*CA)*SY)/ROW2+(FACX-CR1-
     1CR2)*SZ)*SIN(2*PI*(0.5*L/LMDA-ABS(S)))/S
      RETURN
      END
¬LOAD XR,MAP
¬DATA
```

```
C       THIS PROGRAM ANALIZES SIGNAL STRENGTH PEAKS
C
C       SIGNAL PEAKS ARE INPUT AND PEAK TO PEAK VARIATIONS
C       ARE COMPUTED.  NEXT THE DISTRIBUTION OF THE
C       PEAK TO PEAK VARIATIONS IS COMPUTED AND PLOTTED.
C       FINALLY THE PROBIBILITY THAT THE VARIATIONS WILL
C       BE LESS THAN A CERTAIN VALUE IS COMPUTED.
        DIMENSION X(900),Y(900),Z(900),ZN(900),ZP(900),TOP(900
        REAL LABEL/ '      '/
        REAL*8 TITLE(12)
    5   READ(5,6)NOPLOT
    6   FORMAT(I3)
        READ(5,7)DELTA
    7   FORMAT(F10.4)
        READ(5,8)(TITLE(I),I=1,2)
    8   FORMAT(2A8)
        DO 1000 J=1,NOPLOT
C       INITIALIZE PARAMETERS FOR CALCOMP PLOT
        IWIDE=6
        IHIGH=7
        IGRID=1
        ITYPE=0
        MC=0
        IXUP=0
        IYRT=3
        MDXAX=2
        MDYAX=2
        EXSC=0
        YSCL=0
        WRITE(6,9)
    9   FORMAT(1H1,////)
        READ(5,10)(TITLE(I),I=3,6)
   10   FORMAT(4A8)
        READ(5,11)(TITLE(I),I=7,12)
   11   FORMAT(6A8)
        WRITE(6,12)(TITLE(I),I=1,6)
        WRITE(6,12)(TITLE(I),I=7,12)
   12   FORMAT(27X,6A8)
        WRITE(6,13)
   13   FORMAT(/,36X,'  VARIATIONS ')
   15   AVE=0.0
        READ(5,6)NPTSS
        AI=0.0
        READ(5,20)(Z(I),I=1,NPTSS)
   20   FORMAT(F8.3)
        NPT=NPTSS-2
C       COMPUTE PEAK TO PEAK VARIATIONS
C       COMPUTE AVERAGE AND STANDARD DEVIATION
        DO 100 I=1,NPT
        AI=AI+1.0
        II=I+1
        Z1=Z(I)
        Z2=Z(II)
        Z(I)=Z2-Z1
        AVE=AVE-(AVE-Z(I))/AI
        AA=AI
  100   CONTINUE
   104  WRITE(6,105)(Z(I),I=1,NPT)
  105   FORMAT(13X,10F6.1)
   106  ST1=0.0
        DO 108 I=1,NPT
        ST1=ST1+(AVE-Z(I))*(AVE-Z(I))/(AI-1.0)
  108   CONTINUE
C       FIND MAXIMUM VALUE
        IN=0
        IP=0
        ZM=0.0
        DO 130 I=1,NPT
        IF(Z(I)) 110,130,120
```

```
 110   IN=IN+1
       ZN(IN)=Z(I)
       IF(ZN(IN)+ZM)125,130,130
 120   IP=IP+1
       ZP(IP)=Z(I)
       IF(ZP(IP)-ZM)130,130,125
 125   ZM=SQRT(Z(I)*Z(I))
 130   CONTINUE
       ZZ=0.0
 131   IF(ZM-ZZ) 134,134,132
 132   ZZ=ZZ+1.0
       GO TO 131
 134   ZM=ZZ+DELTA
C      COUNT NUMBER OF POINTS IN EACH TWO DELTA INTERVAL
       AI=0.0
       I=0
 140   I=I+1
       X(I)=AI-ZM
       XL=X(I)-DELTA
       XM=X(I)+DELTA
       Y(I)=0.0
       DO 150 K=1,NPT
       IF(XL.GT.Z(K).OR.Z(K).GE.XM) GO TO 150
       Y(I)=Y(I)+1.0
 150   CONTINUE
       AI=AI+DELTA*2.0
       IF(ZM-X(I))160,160,140
 160   NPTS=I
       WRITE(6,180)AVE,ST1
 180   FORMAT(/,16X,'AVE. VARIATION ='F5.1,'DB',5X,
      1'STANDARD DEVIATION = ',F5.1,/)
       IF(NPT.LT.210) GO TO 185
       WRITE(6,9)
       WRITE(6,12)(TITLE(I),I=1,6)
       WRITE(6,12)(TITLE(I),I=7,12)
  185  WRITE(6,190)
 190   FORMAT(16X,'GRAPHED DATA IS, VARIATIONS ',
      1' VS. POINTS AT THAT VALUE',/)
       WRITE(6,195)
 195   FORMAT(16X,'       VARIATIONS, DB',13X,
      1'POINTS AT THAT VALUE')
C      PRINT DISTRIBUTION
       DO 230 I=1,NPTS
       WRITE(6,200) X(I),Y(I)
 200   FORMAT(20X,F10.2,20X,F10.1)
 230   CONTINUE
C      COMPUTE AVERAGE, VARIANCE, AND STANDARD DEVIATION FOR
C      BOTH POSITIVE AND NEGITIVE DISTRIBUTIONS
       AP=0.0
       AN=0.0
       APOS=0.0
       ANEG=0.0
       DO 240 I=1,IN
       AN=AN+1.0
       ANEG=ANEG-(ANEG-ZN(I))/AN
 240   CONTINUE
       DO 260 I=1,IP
       AP=AP+1.0
       APOS=APOS-(APOS-ZP(I))/AP
 260   CONTINUE
       WRITE(6,270)ANEG
 270   FORMAT(/,16X,'NEGITIVE VALUES MEAN',8X,'=',F7.2)
       WRITE(6,275)APOS
 275   FORMAT(16X,'POSITIVE VALUES MEAN',8X,'=',F7.2)
       STNEG=0.0
       STPOS=0.0
       DO 325 I=1,IN
       STNEG=STNEG+(ANEG-ZN(I))*(ANEG-ZN(I))/(AN-1.0)
 325   CONTINUE
       DO 330 I=1,IP
       STPOS=STPOS+(APOS-ZP(I))*(APOS-ZP(I))/(AP-1.0)
 330   CONTINUE
```

```
      WRITE(6,400)STNEG
 400  FORMAT(16X,'NEGITIVE VARIANCE',11X,'=',F7.2)
      WRITE(6,405)STPOS
 405  FORMAT(16X,'POSITIVE VARIANCE',11X,'=',F7.2)
      STDP=SQRT(STPOS)
      STDN=SQRT(STNEG)
      WRITE(6,420)STDN
 420  FORMAT(16X,'NEGITIVE STANDARD DEVIATION = ',F6.2)
      WRITE(6,425)STDP
 425  FORMAT(16X,'POSITIVE STANDARD DEVIATION = ',F6.2)
 500  FORMAT(1H1)
C     CALL PLOT SUBROUTINE
      CALL DRAW(NPTS,X,Y,MC,ITYPE,LABEL,TITLE,EXSC,YSCL,
     1IXUP,IYRT,MDXAX,MDYAX,IWIDE,IHIGH,IGRID,LAST)
C     COMPUTE PROBIBILITIES
      YYY=0.0
      IJ=(NPTS/2)-1
      WRITE(6,9)
      WRITE(6,12)(TITLE(I),I=1,6)
      WRITE(6,12)(TITLE(I),I=7,12)
      WRITE(6,510)
 510  FORMAT(////,18X,'PEAK TO PEAK POWER',10X,
     1'PROBIBILITY VARIATION WILL')
      WRITE(6,520)
 520  FORMAT(18X,'(ABSOLUTE VALUE, DB)',8X,
     1'BE LESS THAN GIVEN AMMOUNT',///)
      DO 600 I=1,IJ
      IJJ=NPTS-I+1
      YYY=YYY+Y(I)+Y(IJJ)
      PB(I)=(AA-YYY)/AA
      X(I)=X(IJJ)-DELTA
      WRITE(6,560)X(I),PB(I)
 560  FORMAT(20X,F10.2,22X,F10.3)
 600  CONTINUE
1000  CONTINUE
      STOP
      END
```

```
C       THIS PROGRAM ANALIZES SIGNAL STRENGTH PEAKS
C
C       PEAKS IN SIGNAL STRENGTH ARE INPUT AND THE PROGRAM
C       FIRST AVERAGES THEM, THEN IT NORMALIZES THE VALUES
C       BY SUBTRACTING THE AVERAGE FROM EVERY VALUE.
C       THE PROGRAM THEN COMPUTES AND PLOTS THE DISTRIBUTION
C       OF THE NORMALIZED VALUES ABOUT THE AVERAGE.
        DIMENSION X(900),Y(900),Z(900),ZN(900),ZP(900)
        REAL LABEL/ '    '/
        REAL*8 TITLE(12)
    5   READ(5,6)NOPLOT
    6   FORMAT(I3)
        READ(5,7)DELTA
    7   FORMAT(F10.4)
        READ(5,8)(TITLE(I),I=1,2)
    8   FORMAT(2A8)
        DO 1000 J=1,NOPLOT
C       INITIALIZE PARAMETERS FOR CALCOMP PLOT
        IWIDE=6
        IHIGH=7
        IGRID=1
        ITYPE=0
        MC=0
        IXUP=0
        IYRT=3
        MDXAX=2
        MDYAX=2
        EXSC=0
        YSCL=0
        WRITE(6,9)
    9   FORMAT(1H1,////)
        READ(5,10)(TITLE(I),I=3,6)
   10   FORMAT(4A8)
        READ(5,11)(TITLE(I),I=7,12)
   11   FORMAT(6A8)
        WRITE(6,12)(TITLE(I),I=1,6)
        WRITE(6,12)(TITLE(I),I=7,12)
   12   FORMAT(27X,6A8)
        WRITE(6,13)
   13   FORMAT(//,38X,'  DATA POINTS',/)
   15   AVE=0.0
        READ(5,6)NPTSS
        AI=0.0
        READ(5,20)(Z(I),I=1,NPTSS)
   20   FORMAT(F8.3)
C       COMPUTE AVERAGE AND STANDARD DEVIATION
        DO 100 I=1,NPTSS
        AI=AI+1.0
        AVE=AVE-(AVE-Z(I))/AI
  100   CONTINUE
        IF(NPTSS.LT.586) GO TO 106
        WRITE(6,105)(Z(I),I=1,585)
        WRITE(6,9)
        WRITE(6,12)(TITLE(I),I=1,6)
        WRITE(6,12)(TITLE(I),I=7,12)
        WRITE(6,13)
        WRITE(6,105)(Z(I),I=586,NPTSS)
        GO TO 107
  106   WRITE(6,105)(Z(I),I=1,NPTSS)
  105   FORMAT(11X,9F7.1)
  107   ST1=0.0
        DO 108 I=1,NPTSS
        ST1=ST1+(AVE-Z(I))*(AVE-Z(I))/(AI-1.0)
  108   CONTINUE
C       NORMALIZE DATA
C       FIND MAXIMUM VALUE
        IN=0
        IP=0
        ZM=0.0
```

```
      DO 130 I=1,NPTSS
      Z(I)=Z(I)-AVE
      IF(Z(I)) 110,130,120
  110 IN=IN+1
      ZN(IN)=Z(I)
      IF(ZN(IN)+ZM)125,130,130
  120 IP=IP+1
      ZP(IP)=Z(I)
      IF(ZP(IP)-ZM)130,130,125
  125 ZM=SQRT(Z(I)*Z(I))
  130 CONTINUE
      ZZ=0.0
  131 IF(ZM-ZZ) 134,134,132
  132 ZZ=ZZ+1.0
      GO TO 131
  134 ZM=ZZ+DELTA
C     COUNT NUMBER OF POINTS IN EACH TWO DELTA INTERVAL
      AI=0.0
      I=0
  140 I=I+1
      X(I)=AI-ZM
      XL=X(I)-DELTA
      XM=X(I)+DELTA
      Y(I)=0.0
      DO 150 K=1,NPTSS
      IF(XL.GT.Z(K).OR.Z(K).GE.XM) GO TO 150
      Y(I)=Y(I)+1.0
  150 CONTINUE
      AI=AI+DELTA*2.0
      IF(ZM-X(I))160,160,140
  160 NPTS=I
      WRITE(6,180)AVE,ST1
  180 FORMAT(/,16X,' AVERAGE POWER = 'F5.1,'DB',5X,
     1'STANDARD DEVIATION = ',F5.1)
      WRITE(6,190)
  190 FORMAT(//,16X,'GRAPHED DATA IS, NORMALIZED POWER',
     1' VS. POINTS AT THAT POWER',//)
      WRITE(6,195)
  195 FORMAT(16X,'NORMALIZED POWER, DB',13X,
     1'POINTS AT THAT POWER',//)
      DO 230 I=1,NPTS
C     PRINT DISTRIBUTION
      WRITE(6,200) X(I),Y(I)
  200 FORMAT(20X,F10.2,20X,F10.1)
  230 CONTINUE
C     COMPUTE AVERAGE, VARIANCE, AND STANDARD DEVIATION FOR
C     BOTH POSITIVE AND NEGITIVE DISTRIBUTIONS
      AP=0.0
      AN=0.0
      APOS=0.0
      ANEG=0.0
      DO 240 I=1,IN
      AN=AN+1.0
      ANEG=ANEG-(ANEG-ZN(I))/AN
  240 CONTINUE
      DO 260 I=1,IP
      AP=AP+1.0
      APOS=APOS-(APOS-ZP(I))/AP
  260 CONTINUE
      WRITE(6,270)ANEG
  270 FORMAT(/,16X,'NEGITIVE VALUES MEAN',8X,'=',F7.2)
      WRITE(6,275)APOS
  275 FORMAT(16X,'POSITIVE VALUES MEAN',8X,'=',F7.2)
      STNEG=0.0
      STPOS=0.0
      DO 325 I=1,IN
      STNEG=STNEG+(ANEG-ZN(I))*(ANEG-ZN(I))/(AN-1.0)
  325 CONTINUE
      DO 330 I=1,IP
      STPOS=STPOS+(APOS-ZP(I))*(APOS-ZP(I))/(AP-1.0)
  330 CONTINUE
      WRITE(6,400)STNEG
```

```
 400   FORMAT(16X,'NEGITIVE VARIANCE',11X,'=',F7.2)
       WRITE(6,405)STPOS
 405   FORMAT(16X,'POSITIVE VARIANCE',11X,'=',F7.2)
       STDP=SQRT(STPOS)
       STDN=SQRT(STNEG)
       WRITE(6,420)STDN
 420   FORMAT(16X,'NEGITIVE STANDARD DEVIATION = ',F6.2)
       WRITE(6,425)STDP
 425   FORMAT(16X,'POSITIVE STANDARD DEVIATION = ',F6.2)
 995   FORMAT(1H1)
C      CALL PLOT SUBROUTINE
       CALL DRAW(NPTS,X,Y,MC,ITYPE,LABEL,TITLE,EXSC,YSCL,
      1IXUP,IYRT,MDXAX,MDYAX,IWIDE,IHIGH,IGRID,LAST)
1000   CONTINUE
       STOP
       END
```

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The strength of an incoming signal to a shipbo d communications station is measured. The variations in this signal are analyzed for various conditions of roll, pitch, and signal direction. Graphs and computer outputs are used to present the magnitude and randomness of these signal variations. A smooth surface approximation is used to simulate the problem, and this simulation is compared to observed data.

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